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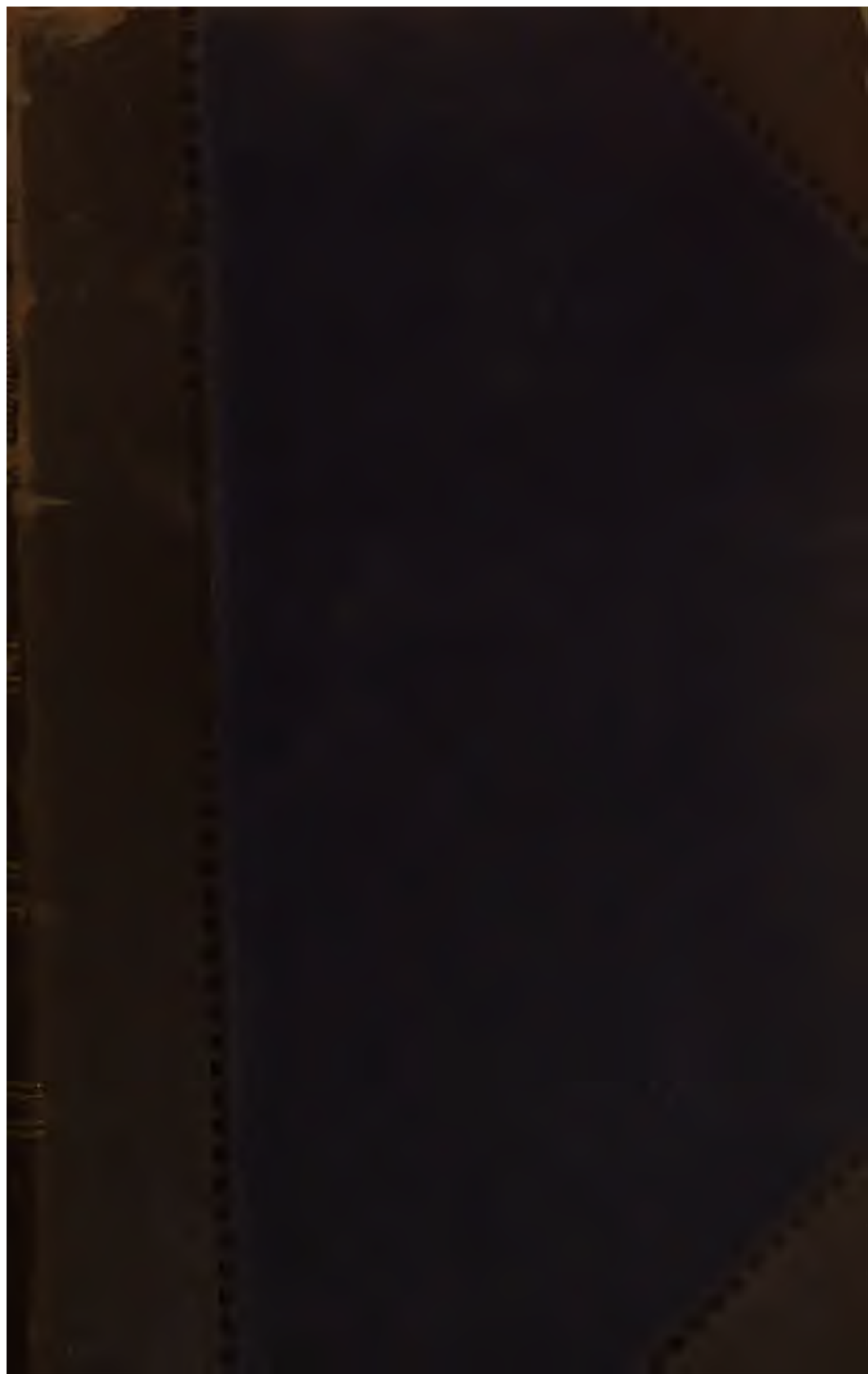
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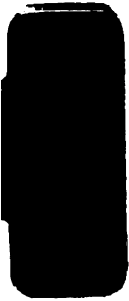
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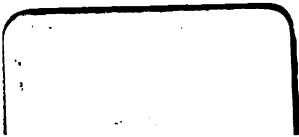
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 The London Hospital Reports.
 The St. Thomas's Hospital Reports.
 The Pharmaceutical Journal.
 The Transactions of the Obstetrical Society of London.
 American Journal of Medical Science (care of Messrs. Trübner and Co., 60, Paternoster Row, E.C.)
 Annales de Dermatologie et de Syphiligraphie (care of M. le Dr. Doyon, 33, Rue de Jarente, Lyon, Rhône).
 Revue des Sciences Médicales en France, et à l'Étranger (care of M. le Dr. Hayem, 17, Rue du Sommerard, à Paris).
 The Library of the University of Utrecht (through Professor Donders).
 Journal de Thérapeutique (care of M. le Dr. Labbé, 10, Rue de Turbigo, Paris).

The Subscription List for Vol. XX will be closed on the 1st of November, 1874.

SURGICAL RECORDS.

By J. COOPER FORSTER.

No prefatory remarks are necessary to introduce the surgical records of my patients during the past year. The number of cases has been about the same as last year (nearly 400). Of these, fifty-three have been condensed and reported in this volume. The arrangement is, as usual, that adopted by the Nomenclature Committee of the College of Physicians. Of the interesting surgical questions broached last year, Ether *versus* Chloroform has occupied a large share of attention, and I have devoted a few lines expressing my opinion on this subject. Skin grafting is now so thoroughly established that all wounds of any large size have grafts inserted; it becomes needless, therefore, to multiply cases or make any further remarks thereon; while of the antiseptic treatment, its success or otherwise mainly depends upon the energy of my dressers, and therefore my results are but fluctuating.

CASE 1.—*Arthritis of Wrist, Ankle, and Temporo-maxillary Joints, after Acute Rheumatism.*

Elizabeth W—, æt. 40, of healthy family; married; has had four children, all healthy; lately has not been living well. Seven weeks ago she had rheumatic fever for the first time; all the joints in her limbs were affected, and also the left temporo-maxillary articulation; the swelling and pain have now sub-

sided, except from the left wrist, right ankle, and left side of her face.

On admission.—The left hand and wrist are much swollen and very painful; there is fluctuation on the back of the wrist and slight increase of heat.

A straight splint was put on and poultices applied.

She was discharged in three weeks much improved.

CASE 2.—Chronic Arthritis of both Elbow-joints.

Thomas H—, æt. 49, had slight rheumatic pains in his knees about ten years ago, but has never been laid up; has no knowledge of injury to either elbow; first had pain in left elbow eighteen months ago; this gradually increased, and six months ago the right elbow also became affected. He has no pain elsewhere; the pain is increased by damp or cold and relieved by warmth. He has never had venereal disease, and has lived regularly. His father suffered slightly from rheumatism.

On admission.—Both elbow-joints are swollen; the swelling is soft and fluctuating, and bulges around the bony prominences. The bones do not appear to be thickened. The movements are limited, more especially in the left joint, and are attended by a peculiar friction. The skin is normal in colour, but there is increased heat in both joints.

Iodide of potassium (twenty-five grains in water) was given three times a day for three weeks without any marked benefit, and he was discharged unrelieved.

In Case 1 the diagnosis was difficult between pyæmia and rheumatism. Pyæmia of the joints rarely occurs at the age of forty as an idiopathic disease, but I suppose that such an affection may be assumed to occur sometimes, judging from what one finds on the post-mortem table, for joints full of pus may be observed without any external wound.

On the other hand, being in a surgical ward, one was rather predisposed to call it, from the multiplicity of joints attacked, a case of pyæmia;—more joints being attacked in this disease than in rheumatism. Moreover, there were none of the more

general symptoms of rheumatism, and the disease was intense and non-metastatic in its manifestation. The rapid recovery without severe constitutional disturbance assisted us when a diagnosis was no longer required. Pus, as far as one knows, is rarely, if ever, absorbed. The effusion here *was* absorbed, therefore it was certainly of a serous character, and at the end of three weeks the patient was so far recovered as to be able to leave the hospital. It is at this period of the disease, when the patient is apparently well from the constitutional symptoms of acute rheumatism, that the mischief is said, in common parlance, to settle in one joint.

So far as my observation goes, this is a common termination of rheumatism and a frequent commencement of joint disease. The term rheumatic synovitis is aptly applied to it; but let it not mislead the practitioner. Though so frequently the termination of acute rheumatism, it is also the commencement of serious joint disease. Too much caution cannot be observed in treating these cases; the exact time when the rheumatic character terminates, and the effect of it in a local joint disease commences, is difficult to determine, and the proper and opportune application of splints and local remedies may settle the question of the usefulness or otherwise of the member.

Case 2 is one of a very different class, and, though called chronic rheumatism, rheumatic gout, chronic arthritis, and by several other titles, can scarcely in its results be considered of a rheumatic nature at all. Whatever may be the origin of these cases, in their effects they differ widely from those of ordinary rheumatism or rheumatic fever. In these cases there is more or less formation of adventitious material in, around, and about the capsular ligament, causing more or less swelling, and proving injurious to the free mobility of the joint. The treatment, moreover, is essentially different; the rest prescribed for one would be most detrimental to the other. The movement of a joint affected with rheumatic synovitis or its results would be most injurious, while, in the case of chronic arthritis, though the pain is most severe at all times, it is increased by rest, and active movement is strongly to be recommended. I have said that the term "rheumatic gout" is applied to these cases, but there can scarcely be a greater misnomer. Gout and rheumatism are two distinct diseases, gout being, as far as the surgeon

is concerned, a disease of deposit, whereas rheumatism is accompanied more by fibrinous exudation.

*CASE 3.—Malignant Growth in Neck; Necrosis of Jaw;
Exploratory Operation; Erysipelas.*

Edward D—, æt. 60, about two years ago was under the care of Mr. Birkett for a growth on the lower lip; this was excised, and he remained well till five months ago, when the left side of the lower jaw became painful and swollen. A stump of a tooth was extracted, but the pain and swelling continued to increase; during the last three months several small pieces of bone have come away through an opening in the neck; lately the swelling has encroached on the mouth.

On admission.—The whole of the left cheek is swollen; the skin is cedematous and adherent, and below the jaw the soft parts are puckered, indurated, and red; there are two or three sinuses through which a purulent discharge escapes; they lead towards the jaw, but no bare bone can be felt with a probe. As it was just possible that the whole of the thickening might be due to simple necrosis of the jaw, ether was given, and an exploratory incision made; then, however, it became clear that the swelling consisted of a malignant growth invading the bone as well as the soft parts, so much as to render unadvisable any attempt at removal. The healing process advanced slowly for a few days, when erysipelas appeared on the face, and the temperature rose to 103.2° . He was given an emetic and a brisk purge, followed by perchloride of iron and quinine. The erysipelas soon subsided, and he left the hospital in a month with the growth slightly increased in size.

The erysipelas was probably communicated from a patient in a neighbouring bed.

CASE 4.—Cancer of Omentum and Umbilicus simulating Hernia.

Mary T—, æt. 66, married and had four children; in good health till four years ago, when she noticed a projection at the navel, about the size of the tip of her finger. It gave her no inconvenience except when her stays pressed on it. Her

bowels have been regular till one month ago, when diarrhœa came on; this soon ceased without treatment, but again came on two weeks ago, accompanied by pain in the abdomen, especially at the navel; she sought advice and had medicine, but did not inform the doctor of the swelling. The diarrhœa ceased, but the pain increased, and vomiting came on about one week ago, since which she has rapidly got worse. Directly she drew attention to the swelling she was sent to the hospital.

On admission.—Bowels acted naturally yesterday. Vomits frequently a sour offensive fluid, not fœcal. Her look is anxious, tongue moist and white, skin warm and moist; pulse 60, feeble, soft. Is stout and well nourished. The abdomen is distended, tympanitic, and very tender. There is a nodular projection in the left half of the umbilicus, about half an inch in diameter. The skin appears natural everywhere. There is no distinct impulse in the swelling; there is no especial pain elsewhere; there is no fulness in either inguinal or femoral region. Immediately beneath the wall about the umbilicus, and apparently within the cavity of the abdomen, is an ill-defined oval tumour, very hard, slightly movable, and apparently continuous with the hard nodule in the umbilicus. The region over the swelling is dull. There is no evident enlargement of the liver or spleen. The swelling moves with respiratory movements, and its lower edge can be sufficiently distinctly defined to prove that it has no intra-pelvic connection.

She is kept in bed with a bag of ice on the tumour, and iced milk to drink.

An injection of gruel was given, which produced an action of the bowels and gave relief.

The vomiting varied much, at times being severe, at others she appeared quite well. Morphia given subcutaneously gave great relief.

In a week she became suddenly worse; the temperature rose rapidly to 104·4°, and she died on the twelfth day.

On post-mortem examination the peritoneum was found to be extensively invaded by cancer, and a mass involving the omentum extended into the umbilicus.

Case No. 4 was of great interest on admission, as it simulated at first sight a small strangulated umbilical hernia. The

diagnosis before admission was that of strangulated hernia, and the error was perpetuated on admission until the case was fairly investigated in bed. The one feature of hernia was the sickness; that and a swelling at the umbilicus, in which there was no impulse on coughing, were sufficient to give colour to the diagnosis; but she had had diarrhœa, the bowels had even acted the day before admission; the swelling was small in size, a rare occurrence in umbilical hernia; the presence of a thickening continuous with the swelling behind the abdominal parietes, led to the opinion that the whole was a mass of cancer, unconnected with the intestines. I need hardly say that no operative measures would have been of the slightest benefit; but, on the contrary, though possibly it might not have been attended by any immediately unfavorable result, it could not have been considered other than an unfortunate mistake. A principle laid down with regard to all herniæ is this—"When in doubt, operate." To a superficial examiner of this case that rule would apply, and he might have operated; but on a careful survey of all the points no doubt ought to have existed, and, therefore, the question of operation was never entertained.

CASE 5.—Epithelioma at outer angle of Orbit; Excision.

Sarah S—, æt. 77, a healthy woman, noticed a growth at the outer corner of the left eyelids about four years ago, which slowly increased, but it has never been painful.

On admission, July 4th.—She has a flattened circular growth about half an inch in diameter, epithelial in nature, in the left malar region, advancing towards the eyelids. The cervical glands are enlarged. The growth was excised, and she left the hospital in a week with the surface granulating.

CASE 6.—Epithelioma of Lower Lip; Excision; Delirium; Erysipelas; Death.

Charles E—, æt. 70. No history of similar disease in family; has been healthy; smokes a clay pipe. Three months ago he noticed a pimple on the inner surface of his lip, which has slowly increased.

On admission, July 16th.—There is a growth on the edge of the lower lip, nearly in the centre, and measuring one inch and a half across, slightly elevated, hard, and invading the substance of the lip; ulcerated on the surface; edges not everted; pain slight; no enlargement of glands.

Bichloride of methylene was given, and the dresser excised a V-shaped piece of the lip including the growth; the bleeding was free; all vessels were secured by torsion, and the parts adjusted with a pin and figure-8 suture, two or three ordinary sutures, and strapping.

The wound healed, but in a few days he refused food, became delirious, erysipelas attacked his lip, and he gradually sank on the eleventh day.

On post-mortem examination the bronchial tubes were found dilated; the kidneys granular; the wound nearly healed; the neighbouring glands apparently affected.

CASE 7.—Epithelioma of Tongue; removal by Galvanic Cautery; Recurrence.

Henry W—, æt. 49. No history of similar disease in family; general health good; smokes a clay pipe. Ten months ago a painful ulcer came on the left side of the tongue near the tip; he attributed it to friction of a rough tooth, which he then had drawn; the ulcer improved a little, but soon again extended. Six weeks ago he noticed a hard lump on the left side of the tongue. Caustic has been applied to the ulcer three times, but it has slowly increased.

Lately he has not been able to eat solid food on account of the pain. He has wasted much.

On admission, May 6th.—On the left side of the tongue is an ovoid ulcer corresponding to the three molar teeth, about $1\frac{1}{2} \times \frac{1}{2}$ inch. The edges are thickened and hard, and slightly everted. The side and under surface of the tongue in front of this ulcer is excoriated in patches. It is painful, especially after having been touched. There is no roughness of the teeth. Externally and in the submaxillary region the parts appear normal, and very slight, if any, hardness can be felt on the left side.

13th.—Methylene was given, followed by ether. The growth was encircled by a wire *écraseur*, retained in position by pins; the *écraseur* was then slowly screwed up, and the wire heated by the battery. The wire broke, and this caused delay; the growth was removed in fragments; there was very slight hæmorrhage, which did not require any interference.

He left the hospital with the surface granulating. He returned in a month, the growth having recurred before the surface had healed. Further interference was considered not advisable.

CASE 8.—*Epithelioma of Prepuce and Glans Penis; Congenital Phimosis; Amputation.*

Stephen H—, æt. 51, married and had a family; youngest five years old; has never been able to retract the prepuce entirely; has had gonorrhœa, with suppurating gland in right groin, but never had syphilis.

For the last ten years has noticed some thickening under prepuce, and five years ago found a distinct swelling the size of a pea beneath the prepuce on the left side. This gradually increased, but has only been painful during the last six months. He has used lotions, and caustic has been applied on three occasions without benefit.

On admission, July 21st.—On the free edge and inner surface of the prepuce, on the left side, is a warty growth; there is a dirty, watery discharge, and slight shooting pain. No trouble in micturition.

The glands in left groin are slightly enlarged. Bichloride of methylene given, followed by ether. Prepuce slit up; growth found to invade prepuce and glans extensively, so the distal third of the penis was removed with the galvanic *écraseur*; there was no bleeding; a catheter was passed and tied in during the week following the operation; the glands in the groin increased slightly, but again decreased. He left in a fortnight, the surface still granulating.

Of these four cases of epithelioma in various parts of the body, two occurred in the face. Case 6, that of an old man of

seventy, was unfortunately attended by death, a somewhat uncommon sequence of operation after the removal of growths in this region of the body. He appeared to fail, as many old men do, from a flabby heart and granular kidneys, and yet the constitutional state was not previously such as to induce one to let him alone.

In Case 7, an epithelioma of the tongue, the disease was extirpated by the galvanic cautery *écraseur*. The advantage of this plan of treatment for any or every form of cancer of the tongue need only be tried or seen to be adopted. It is true that the bleeding when excision by the knife is carried out quickly ceases, but the thorough destruction of the surrounding tissues beyond the line of removal is very completely effected by the wire cautery, whereas where the knife is used these parts are left untouched. The difficulty of the application of this mode of treatment is, however, an insuperable obstacle to its general adoption until such time as the apparatus be made both more portable and less expensive. Till then the ordinary *écraseur* will be found most convenient, and I think it may be safely affirmed that less blood may possibly be lost with this instrument than with the galvanic *écraseur*, on account of the nice adaptation of heat which is required with the latter. If the wire be too hot it cuts through the tissue so rapidly that a knife might as well be employed. The bleeding is quite as copious, since the blood has not had time to coagulate, and, indeed, the wire has run through the tissues and destroyed without sealing them.

For the perfect success of the cautery the wire should be kept steadily at no more than a dull-red heat, and the tissue slowly cut through. With the ordinary *écraseur* properly used no blood need be lost. But then the operation is tedious in the extreme, particularly in such a tough and yet highly vascular organ as the tongue, and one misses also much of the destructive charring of the tissue outside the constricting wire.

In Case 8 the galvanic cautery was also used, but in the instance of amputation of the penis there is one disadvantage, which consists in not being able to leave the mucous membrane of the urethra in the corpus spongiosum sufficiently long to allow of its being stitched to the skin, a practice that cannot too strongly be insisted on for the comfort of the patient.

This case, one of phimosis with epithelioma, affords another illustration of the advantage of circumcision where the patient is the subject of congenital phimosis; few cases of epithelioma of the penis are seen which do not include this condition.

CASE 9.—*Sarcoma of Scalp ; Excision ; Recurrence ; Phlebitis of Longitudinal Sinus ; Pyæmia ; Death.*

John N—, æt. 31; no history of tumour in family. Twelve years ago had a blow on right side of head, and was again struck on the same spot seven years ago. Nothing unusual was noticed until three years ago, when a swelling appeared over the right temporal bone; this slowly increased for two years, when it was excised. The wound healed, leaving a slight swelling, which soon increased, and in six months it was excised for the second time. The wound healed quickly, but the growth recurred and was excised for the third time after an interval of four months. On this occasion the bone was exposed. The wound healed slowly and the growth reappeared, so he came here.

On admission, March 26th.—His general health is good. The growth is about 4 by 3 by 2 inches over the occipital, temporal, and parietal bones on the right side; the skin is tightly stretched; it is soft and elastic, as if containing fluid. No enlarged glands. Hæmorrhage occurred spontaneously; it was arrested by perchloride of iron and pressure.

April 1st.—Ether given and growth excised by two curved incisions, leaving a surface about 5 by 3 inches entirely bare of soft parts.

The bleeding was very free; the vessels were secured by acupressure pins and all oozing prevented by firm pressure.

The growth was soft and gelatinous, but did not yield any juice when scraped. Under the microscope a faintly striated stroma in parallel lines, with rounded nuclei, was seen.

The surface became slowly covered by granulations, but at the same time an elevated mass appeared at the upper edge.

May 9th.—Methylene and ether given, and a portion 2 by 1 inches, consisting partly of scalp and partly of granulation, was excised, the bone beneath being scraped with the knife;

vessels were secured as before. There was no constitutional disturbance after either operation, and the patient was soon about the ward.

28th.—Wound still granulating healthily, but patient feels ill, vomiting, shivers; face flushed; tongue white and furred.

From this date he got rapidly worse, the temperature rising to 104.1° ; profuse sweatings and eventually lung complications coming on. He died on July 5th. At the time of the second operation and up to the date of onset of his constitutional disturbance there were cases of erysipelas and septicæmia in the ward, yet his wound continued to granulate and the growth to reappear without any sign of local inflammation.

Post-mortem, July 7th, by Dr. Fagge.—Two soft gelatinous masses were springing from the bone at a little distance apart, the bone being eroded. At the upper part of the region exposed by the operation a piece of bone about the size of half a crown was yellow throughout its thickness and on the inner surface also. This piece of bone was on the *right* side, within half an inch of the middle line. The dura mater at the spot appeared healthy. In the longitudinal sinus was a little post-mortem clot. On the *left* side of its floor, *opposite* the necrosed bone, there was a raised patch of purulent lymph, and corresponding with this, outside the sinus, there was a considerable quantity of purulent material covering the *left* side of the falx cerebri. Also between the convolutions of the left hemisphere, within the longitudinal fissure, there was some pus beneath the visceral arachnoid.

The interior of the brain was everywhere quite healthy. The lateral sinuses were free as far as the jugular fossa, where on the right there was a quantity of thick pus.

In the right side of the neck there was an abscess about the size of a walnut just below the hyoid bone; the jugular vein was healthy as high as it could be traced.

Larynx.—The left ary-epiglottidean fold was œdematous and swollen, the left crico-arytænoid joint suppurating, and the arytænoid cartilage necrotic.

Pleuræ.—Both affected; on *right* some pus and adhesions.

Lungs.—Collapsed; on *left* a thick layer of lymph, beneath which at one spot a sloughing cavity was found.

Heart healthy. Liver fatty. Kidneys healthy (?), decomposed.

These recurrent growths are at all times interesting, occurring as they do often in youngish people, and in spite of the most complete removal. The growth seems to recur in the middle of healthy granulating tissue. In this case the growth had been removed three times during the year, and he was admitted to Guy's within four months of the last operation for a third recurrence. I removed it twice, and it still recurred; and well aware of this liability, when first operating, I took a large sweep of healthy skin, and bared the bone of pericranium. Notwithstanding this, as the granulations formed on the exposed bone and the parts were all round apparently healthy and healing, a mass appears in the centre of the sore, a soft elevated spot, which was a return of the disease. Being removed again to the extent of exposing and scraping the bone, it again behaved in a like manner, and yet after death the bone, though eroded on its surface, and in part dead through its whole thickness, was still of its natural hardness and uninvaded by the growth. Whence, then, did it come?

CASE 10.—*Epylis on Lower Jaw ; Excision, with a portion of the Alveolus.*

Walter D—, æt. 12. No history of tumour in family; states that he was quite well six months ago, when he noticed a tooth loose (most probably the left temporary canine). This troubled him so much, although it was free from pain, that he attempted to pull it out, but failed; he sought assistance from a friend, who removed the tooth with a small pair of pincers; in doing this the gum was torn, and about two weeks after he noticed a small swelling; this he pricked with a pin, thinking to do it good; it bled a little, and troubled him less for a time, but has since slowly increased. Nothing further has been done to it, but the left lower canine tooth has appeared since the swelling commenced.

On admission, April 17th.—In fair health. On the alveolar part of the lower jaw is a growth springing from the region of the left canine, five eighths of an inch on its upper surface, placed between the first left bicuspid and left lateral incisor, extending backwards beneath the tongue, reaching the inner surface of the second left temporary molar and the right

central incisor. It bulges the front plate of the alveolus slightly outwards, and the left canine tooth projects outwards and upwards from this bulged portion.

The growth is flattened, and measures one inch in each diameter. It is red, but rather darker than normal gum. It is irregular, firm, and elastic, not tender, except at its most posterior and under part. There is no swelling externally, and no enlargement of glands can be detected. The incisors, the left canine, first bicuspid, and second temporary molar are loose, the left lateral incisor being most so; the incisors are pushed to the right of their normal position, but the bicuspid is not displaced.

April 22nd.—Anæsthesia induced, two teeth extracted, and the growth removed with a portion of the alveolus.

On section it appeared of a port-wine colour; soft, not yielding a juice; the base distinct from surrounding structures.

Under the microscope it appeared to consist almost entirely of myeloid cells of various shapes, but most of them rounded and having a distinct outline.

29th.—He left the hospital; the surface was still granulating.

CASE 11.—*Tumours on the Nose; Follicular Sarcoma.*

George D—, æt. 37. Six weeks ago noticed a small spot on the skin of the left side of the nose. He got a friend to squeeze it, who used considerable force, expecting to squeeze out a "maggot." About ten days after this two red pimples appeared in the site of the present growths; these had white heads; they were lanced, blood only and no matter escaped; since then the growths have slowly increased.

On admission, June 18th.—He is healthy; has several visible sebaceous follicles, with black points, over his nose. On the left ala are two circular, flattened growths, about half an inch diameter and a quarter of an inch high, with everted edges. The surfaces are dry and encrusted with secretion. There is no pain, and the skin around is natural.

19th.—Anæsthesia induced and growths excised.

July 7th.—He left; the surfaces nearly healed.

The growth was of a sarcomatous nature, appearing to attack the tissues surrounding the follicles of the skin.

CASE 12.—Recurrent Spindle-celled Sarcoma in Leg; Excision.

William L—, 60. No history of tumour in family. Has never had venereal disease in any form. Always had good health. About two years ago he first noticed a swelling the size of a hedge-nut on the outer and back part of the left leg, three inches below the knee; it was very hard; it soon commenced to grow rapidly and become painful.

In April, 1872, *i. e.* after sixteen months' growth, it was as large as an egg, and was then excised by a surgeon. The wound soon healed, and nothing abnormal was noticed for three months, when a small nodule was found just above the former; this nodule has not much increased since; soon after this a growth commenced in the cicatrix, and increased rapidly.

On admission, December 4th, 1872.—General health good. On the outer, back, and upper part of the left leg is a tumour about $3 \times 2\frac{1}{2}$ inches, nodular, ovoid, involving the skin, but movable over the deeper parts; the skin is bluish, and marked by a cicatrix; above this is a smaller nodule, ovoid, $1 \times \frac{1}{2}$ inch, more deeply situated, the skin being quite natural over it. There is no pain or tenderness in the tumours, but he has occasional pain on the outer side of the foot. There is no enlargement of glands in popliteal space or groin.

December 10th.—Ether given. Growths excised with surrounding skin and some muscle and fascia, which was adherent to under surface, leaving a surface about 6×4 inches; several vessels were twisted, one suture inserted at the lower part, and the remainder left to granulate.

The growth was made up of three oval lobules, firm, not yielding a juice; the largest appeared to be degenerating in its centre.

Under the microscope large polynucleated epithelial cells were found near the surface, and large spindle cells in the deeper layers. The smaller nodule, which was completely sub-cutaneous, was partly made up of condensed connective tissue.

Very slight constitutional disturbance followed the operation; the wound healed slowly by granulation, and he was discharged with it still healing on March 2nd.

CASE 13.—Thyroidal Tumour in Neck.

Charles S—, æt. 14. No similar disease in family. All healthy. General health good; was born and has always lived in the parish of Lewisham, Kent.

Was quite well before last winter, when he had a cough, and his mother noticed a swelling in his neck. This increased in size, and his breathing became noisy; has never had any pain or dysphagia; has had slight dyspnoea, but not paroxysmal. Has not been under any medical or surgical treatment.

On admission, May 5th, 1873.—Appears in good health. In the front of his neck is a globular tumour, extending from the right to the left sterno-mastoid, and from the cricoid cartilage to the sternum.

It is elastic, not tender, rises and falls during deglutition; the skin over it is normal; there is no enlargement of lymphatic glands; there is marked pulsation in the neck on the right side, and also in the superior part of the tumour. The eyes are not unusually prominent.

May 7th.—To take Potassii Iodidi gr. v, Aqua ʒss, t. d. Tumour to be painted with Linimentum Iodi once a week or oftener.

June 12th.—The swelling has diminished slightly.

July 3rd.—To take Potassii Iodidi gr. x, Aqua ʒj, t. d.

The swelling is smaller and the respiration less noisy.

August 11th.—Discharged improved.

CASE 14.—Thyroidal Tumour in Neck; Bursal Tumour in Popliteal Space.

Robert B—, æt. 17, states that his parents were healthy; he has been delicate, and his neck has always been large, but there was no evident tumour until two or three months ago, when a distinct swelling was noticed on the left side of the thyroid cartilage, which projected also on the right side; it varied in size at times; he has been under treatment in private, and at

the Throat Hospital, where the swelling on the right side was injected with iodine three times, with slight diminution in size; he has never had any dyspnœa.

On admission, July 30th, he looks fairly healthy. In the neck there is an obvious swelling on the left of the upper part of the thyroid cartilage, extending under the sterno-mastoid muscle. This is about 2×1 inches, ovoid, firm yet elastic, and fluctuation can be felt in it; it is not attached to muscle or skin, but moves with the larynx; on the right side there is an ovoid swelling 3×3 inches, extending from the anterior edge of the left sterno-mastoid below the level of the thyroid cartilage to the posterior edge of the right sterno-mastoid, and from the clavicle to the level of the upper edge of the thyroid cartilage on the right; it is behind the sterno-mastoid, and bulges most at the anterior edge of the right sterno-mastoid one inch above the sternum. The skin is normal except at the most prominent spot, where there is a red point (at seat of puncture).

He also has a swelling in the right popliteal space, resembling a bursa; this has existed some years.

August 1st.—To take Potassii Iodidi gr. v, Aqua ʒj, t. d. To apply Linimentum Iodi daily.

11th.—Discharged, very slightly if at all improved.

CASE 15.—Fatty Tumour in front of Sternum; Excision.

Eliza A—, æt. 27. Two cousins, on her father's side, had tumours. Nothing is known as to their nature; one was operated on and recovered.

General health good. No injury known of. About three years ago she first noticed a small round swelling on the front of her chest; it slowly increased and became painful. She is subject to sore throat, and her hair falls out; she has had a slight irritable eruption on her back.

On admission, February 26th.—Is in good health. In the middle line over the sternum, about one inch from the upper border, is a flattened globular swelling one and a half inches in diameter and three quarters of an inch in depth. The skin over it is natural and movable; the tumour is movable over the bones; it is very tense and elastic; there is no

pain except after firm pressure. Axillary and supra-clavicular glands normal.

March 3rd.—To take Potassii Iodidi gr. xx, Aqua ℥j, t. d.

18th.—Very slight, if any, change, so ether was given and the tumour excised by a vertical incision. It resembled condensed fatty tissue.

April 16th.—Wound healed by granulation. Discharged nearly well.

CASE 16.—Fatty Tumour in Lumbar Region.

Eliza M—, æt. 52, a governess. States that nine years ago she noticed a small swelling about the size of the tip of her finger in her left side; this has slowly increased, and has been painful at times.

On admission, July 3rd, she is healthy and fat. On her left side, between the last rib and the ilium, is a flattened globular swelling about 6 × 4 inches, not well defined, covered by natural skin, soft and fluctuating; it can be moved over the abdominal wall; it is not lobulated, and the skin is not involved; there is only slight tenderness on firm pressure; there is no impulse on coughing; no enlargement of glands can be felt.

Over the last dorsal spine is a hard globular nodule, three eighths of an inch in diameter; this is movable with the skin.

It was regarded as a fatty tumour, and the patient advised not to have any operation performed.

CASE 17.—Cystic Tumour in Parotid Region; Excision.

Isabella F—, æt. 21. Four years ago she had shooting pain in the right side of her face, and then noticed a small swelling in front of the right ear. Very little, if any, change occurred till three months ago, when the growth began to increase rapidly.

On admission, April 28th.—There is a tumour 2 × 1½ inches over the parotid, just in front of the tragus. It is hard, yet fluctuation can be felt. No enlargement of glands in neighbourhood.

April 29th.—Methylene given and tumour excised. During the operation some creamy pus escaped. The cyst-wall was fleshy and trabeculated, resembling the fibrous portion of a lymphatic gland.

May 5th.—Discharged nearly well.

CASE 18.—Blood Cyst in Abdominal Wall; Tapped.

Edward M—, æt. 16. About four months ago began to practise gymnastics, and soon after noticed a swelling in left groin; he ceased to practise, and the swelling disappeared. About one month ago he again practised with a swing, turning a summersault over a bar. The swelling again appeared; he kept at work till two weeks ago, but was then obliged to give up on account of tenderness. The swelling has increased and become harder.

Bowels have acted regularly. Has had nausea, but no vomiting.

On admission, December 5th, 1872.—Is healthy. In the left groin is a swelling $2 \times 1\frac{1}{2}$ inches, ovoid, nodular, one inch from anterior superior spine of ilium, on a level with it, and three inches from umbilicus and symphysis pubis; the skin over it is slightly discoloured and connected by septa beneath; it is raised half an inch from surface at its highest point, the edges gradually sloping off. It can be freely moved about with the skin, and even lifted off the muscles, the fingers nearly meeting beneath; nothing like a pedicle can be detected. Not tender unless tightly grasped. It has a doughy feel. No fluctuation. No impulse on coughing. No enlargement of inguinal glands.

December 12th.—Tapped with trocar and canula; a bloody fluid escaped, leaving some thickening behind.

16th.—Discharged improved.

CASE 19.—Fibrous Tumour in Palm of Hand; Excision.

Henry S—, æt. 33, an engineer. Healthy. Left hand subjected to much friction while at work.

Eighteen years ago a swelling commenced in the left hand, over the head of the fourth metacarpal bone; this has slowly increased, and has only given rise to pain occasionally.

On admission, April 23rd.—He has a swelling $1\frac{1}{2} \times 1\frac{1}{2}$ inches over the fourth metacarpal bone, soft, fluctuating, resembling a cyst. Extending backwards into the palm is a hard cord-like ridge, connecting this swelling with a small hard nodule two or three lines in diameter, about half an inch behind the cyst-like swelling. The ridge gradually subsides behind the nodule. It seems freely movable, and not deeply connected; he has free use of his fingers, and the tumours do not appear to be connected with the tendons.

April 28th.—The tumour was excised.

On examination with the microscope it was found to consist of fibrous tissue enclosing some round cells in its meshes.

May 5th.—Discharged nearly well.

*CASE 20.—Painful Cicatrix on Foot ; former Disease of Tarsus ;
Excision of Nerve ; Diffuse Cellulitis.*

Alice W—, æt. 18, a servant. Some carious bone was removed from the tarsus in August, 1871, and February, 1872. The wound healed, and she returned to her work. She is unable to continue, on account of pain and swelling about ankle.

On admission, February 11th.—General health fair. Just behind and below the internal malleolus of the left foot is a cicatrix, which is very painful. There is no sinus and no inflammation.

February 24th.—Anæsthetic given, an incision made, and a portion of one of the superficial nerves dissected out above the cicatrix; one suture was inserted, and strapping applied to close the wound.

The dressings were not removed before the 27th; great constitutional disturbance came on, the temperature rising to 103° . Rigors, profuse sweating, obstinate vomiting, and rapid wasting; several deposits of pus formed in the leg and thigh, all of which were evacuated by incisions; she remained in a precarious state for more than a month, and then began to improve. At the beginning of June she was able to get up a little each day, and on July 12th she left for a convalescent home, able to walk a little.

The foregoing case forcibly illustrates the risk which attaches

to even slight operations. Few patients have had such a narrow escape from death as this one. She was operated upon on February 24th, a simple incision being made through the skin and a cutaneous nerve exposed. She immediately got diffuse cellulitis, and for four months hovered between life and death. She was of peculiar mental temperament, not exactly hysterical, neither was she idiotic; but it would be interesting to ascertain, if it could be determined, what, if any, relation her mental capacity held to her physical condition.

CASE 21.—Pulsating Tumour in Left Infra-clavicular Region ; Suspected Aneurism.

Susan C—, æt. 40, a hawker, states that she has always had good health, has worked hard, carrying a basket always on her right arm, and for the last ten years has driven a barrow; has had a cough for some years, but has never been laid up; has never had symptoms of syphilis. About five weeks ago had pain in left side of chest, said to be pleurisy. Twelve days ago she noticed pain and swelling below the left clavicle.

On admission, July 21st.—Is a strong healthy looking woman; has slight pain in left side, slight cough, and expectorates a little phlegm; has shooting pain in region of left clavicle. A swelling can be seen below and slightly also above the left clavicle; the skin is normal. There is marked pulsation in the tumour directly forwards, and not expansive; pulsation is also visible in the first intercostal space on each side of the sternum, but more especially on the *right* side; it can also be seen just above the sternum and in each carotid and subclavian region, and also just below the outer half of the right clavicle.

There is no difference perceptible to the finger in the pulsation above the right or the left clavicle, or in either pulse at the wrist. About this, however, there was a difference of opinion, some thinking there was marked diminution in force of the left radial pulse. There is no swelling in the axilla. The swelling is somewhat hard and not well defined. No bruit can be heard at any part. Pulsation can be controlled by pressure on the subclavian above the clavicle.

Lungs normal.

Sphygmographic tracings of the radials were taken by Mr. Mahomed, who reported that they gave no evidence of aneurism of the subclavian.

July 24th.—Ice was applied over the swelling for twenty-four hours, after which the swelling appeared smaller.

August 9th.—Discharged improved.

Case 21 was one of those aneurismal dilatations which, occurring in an important vessel, are usually attended with great difficulty in diagnosis. One material point which assisted us in arriving at the decision that it was no true aneurism was, perhaps, the sex of the patient, though there does not appear to be any reason why a woman engaged in a laborious occupation, such as a street hawker, and carrying heavy weights, should not be the subject of aneurism as much as a man. Aneurism, however, is usually associated with hard drinking, but in this case, as far as one could make out, the consumption of spirits was very small, and of beer only one pint daily. She was a fine, strong, healthy looking woman, and therefore not an unlikely subject for aneurism. The sphygmographic tracings assisted us also materially in the diagnosis by giving negative evidence, but this only on the supposition that the aorta was uninvolved. Had it been so, the tracings would have told nothing.

No bruit could be detected. Rest and the application of ice for a short time diminished the pulsation of the tumour so much that the diagnosis was still more certainly proved.

CASE 22.—Partial Hemiplegia and Convulsions four months after Injury to Head; Trephining; Recovery.

Francis M—, æt. 39. No history of syphilis. Has always been temperate. Nine years ago had a blow on lower part of spine, from which he lost the use of his *right* leg for six weeks.

Four months ago had a blow on the top of his head, which stunned him; he soon recovered his senses, but has never been quite well since. A swelling appeared directly after the injury, and has not yet subsided.

During the last two weeks he has had severe pain in the head, and yesterday he became drowsy and had a fit, in which he fell down quite unconscious; his eyes were fixed and mouth

drawn to the *left side*; in about five minutes he recovered his senses, but another fit came on directly, and in this state he was brought to the hospital.

On admission, April 24th.—He is a strong and healthy looking man. Having recovered from the fit, he complained of pain in his head; he lies on his back, and at intervals of a few minutes has a general spasm of the muscles of the whole body; he also complains of numbness and weakness in *left forearm and right leg*, but yet sensation appears to be perfect over the whole body. The pupils are equal. He feels sick, but has not vomited. His skin is cold and dry; his tongue is dry and covered with thick brown fur in the centre. Pulse strong, 64; temp. 96° F. Bowels open. Urine, sp. gr. 1010, albuminous. Heart sounds normal. There is a slight swelling on the scalp to the right of the median line and a little posterior to a line from one mastoid process to the other.

26th.—Has lost power in whole left side, being unable to raise arm or leg from the bed. Sensation remains perfect on both sides. Temp. 97° F. Cannot see as well with left eye as with right.

Twitchings of abdominal and thigh muscles are brought on by irritation. If raised, the left arm does not drop at once, but is held spasmodically for a second, then drops some distance, is again fixed, and finally falls on the bed. Ordered Potassii Iodidi gr. x, ex Aquâ ℥j every four hours.

27th.—Has had two well-marked fits since 26th, and frequent slight convulsions. Paralysis the same. Optic discs appear normal. Ordered Potassii Iodidi gr. xxx ex Aquâ ℥j four times a day.

28th.—One fit in the night and two this morning; can move his left arm a little; has pain on right side of head; temp. 98·4°. An incision, three inches long, was made through the swelling on the scalp down to the bone, and a little pus escaped.

30th.—Still has frequent fits. Temp. 96·8°; pulse 116, full. Face slightly paralysed on right side.

May 1st.—Has four or five fits every hour; tongue is dry and furred; glands are enlarged on both sides of neck. As no relief ensued on the incision, Mr. Forster made a crucial incision to the right of the median line, on a level with the mastoid process, and removed with the trephine a circle of bone seven eighths

of an inch in diameter ; the bone was rough and excavated on its outer surface, very dense throughout, and from one fourth to three eighths of an inch thick ; the inner surface appeared normal.

2nd.—Temp. 104° ; pulse 160 ; resp. 32. Tongue red and dry ; epistaxis.

3rd.—No fits to-day.

4th.—Erysipelas appeared on scalp and face (probably by contagion from another case in the ward) ; this, however, subsided, and he slowly improved, so that on June 3rd he appeared free from all constitutional disturbance, and was able to get up daily, the wound healing at margin.

July 3rd.—Is able to walk about well, but still has deficient power and numbness of whole of left side except the face. The wound is slowly healing ; some bone is exposed in the wound ; it appears to be separating.

October 16th.—Has had three or four slight fits since June, but has never lost consciousness ; he appears in fair health, and can walk well, but complains of weakness in left leg, and he does not grasp so forcibly with his left hand as with his right. There is still a portion of bone exposed, and an attempt was made to remove it on October 8th without success.

Case 22 cannot be read otherwise than with a vast amount of interest. The cause, effect, and treatment, seem to follow naturally upon one another. The blow four months before his admission had evidently caused osteitis and consequent thickening of bone to a considerable extent. How far this could act, without any distinct local but only general pressure, it is difficult to understand ; but his symptoms were so directly connected with the blow that the fits and subsequent paresis of muscular movements could only be associated with it. The fits continued to increase until the operation, when they entirely ceased, and he has never had any return since.

The piece of bone removed was not an inch in diameter, and it is difficult to understand how so small a mass as it could afford such instant relief by its removal. How did it act ? I presume more by relieving tension than in any other way ; the local bleeding was but slight, the moral effect could be nil, and yet from that day forth he can scarcely be said to have had a fit ; three or four slight ones only are described, and it i

questionable whether they were not produced by indiscretion in his diet. He has never, perhaps, thoroughly recovered the use of his leg, though he walks fairly, and it remains to be seen whether the excitement of work will produce any further mischief. I ought not to omit mention of the question of syphilis. Without any history it was yet thought a safe precaution to administer large doses of iodide, as it was considered a node might have formed within the calvarium. There certainly was a thickening of the bone and formation of pus, and my opinion at first was decidedly in favour of this being the real source of the trouble. In addition, his urine was albuminous, and still continues so.

CASE 23.—Dysphagia and Dyspnœa ; Ulceration of Larynx ; Sudden Death.

Jemima W—, æt. 47; admitted July 16th; states that her mother died of decline; other relatives healthy; general health good; no history of syphilis. Eighteen months ago she began to retch and vomit a clear watery fluid directly on rising and before taking food, she also expectorated much phlegm; she improved under treatment, but similar attacks recurred, accompanied by great pain in both ears. Twelve months ago she first noticed difficulty in swallowing solids; this has gradually increased, so that during the last six weeks she has not taken any solid food. No food has ever returned after having been once swallowed. She has had occasional severe dyspnœa of short duration. She has wasted.

On admission.—She is thin; speaks in a hoarse voice; complains principally of difficulty in swallowing, but can swallow liquids.

On examining the neck nothing beyond slight thickening about the posterior part of the thyroid and cricoid cartilages can be felt.

Through the fauces nothing abnormal can be seen or felt. The epiglottis seems normal, and no abnormal enlargement or ulcer can be detected at the sides or the posterior part; with the laryngoscope nothing abnormal could be seen, and nothing abnormal was detected on careful examination of the thorax.

July 16th.—Ordered Morphine $\frac{1}{4}$ gr. subcutaneously at night.

21st.—Potassii Iodidi gr. 30 ex Aquâ zij t. d.

23rd.—Had an attack of urgent dyspnœa in the night. This was relieved by poultices to epigastrium.

27th.—Another attack of dyspnœa, in which she died suddenly.

Post-mortem examination, by Dr. Fagge.—A short thick flap, formed by the swollen soft parts at the back of the larynx, was found folded back into the pharynx; the interior of the larynx at the base of this flap was extensively ulcerated, the ulceration having extended up to the right ary-epiglottic fold. The right arytenoid cartilage was exposed and discoloured.

The left vocal cord appeared healthy, and so did the anterior part of the right, but its posterior part was ulcerated.

The larynx and the bronchi were filled with puriform mucus.

CASE 24.—Cherry-stone in Right Bronchus; Tracheotomy; Removal of Foreign Body; Death from Broncho-pneumonia.

Lucy J—, æt. 3, admitted June 24th; while at play was seized with urgent dyspnœa, was taken to a doctor, who inverted her and slapped her on the back without benefit; he then examined her throat, and sent her to the hospital. On her way she had dyspnœa and cough, but on admission, four hours after the first symptoms, she appeared quite well and took her tea at table with the other patients. Soon after this she vomited, but was put in bed and passed a quiet night.

June 25th.—Cries continually, and complains of pain in epigastric region. Nothing abnormal could be felt in the fauces. About noon she became more distressed and livid; this increased gradually, and dyspnœa became urgent, so that at 1.30 chloroform was given and the trachea opened. During the operation respiration ceased, but was restored by artificial respiration (manual pressure and inflation); the trachea tube was removed and the larynx carefully examined with a catheter, but nothing found. The neck was simply covered by a warm moist flannel, the tube being left out.

26th.—The right side of thorax expands less than left,

moist sounds are audible over right side, and she complains of pain in front on the right side of sternum; has occasional fits of cough and dyspnoea, during one of which respiration was completely arrested, but was re-established by artificial respiration. After this the opening in the trachea was enlarged, and a cherry-stone was expelled. The wound was left open, and protected as before.

The child's temperature kept above 100.°

She died on July 6th.

At the post-mortem examination by Dr. Fagge the wound in the neck was widely open, and of an ash-grey colour. The cricoid cartilage and three rings of the trachea were divided.

The larynx above the wound was healthy.

The trachea was injected and contained much purulent mucus.

The bronchi were both reddened, and the right was also ecchymosed for about one inch, and there was slight unevenness of its mucous surface just below the bifurcation of the trachea.

The bronchial tubes all through the right lung were filled with pus, and some contained tough fibrinous casts.

The right lung was hepatized; in greater part the left was healthy.

The right pleura was inflamed at parts.

The heart and other organs were healthy.

Hernia.

CASE 25.—John H—, æt. 21; oblique inguinal hernia on left side; first noticed twelve years ago; never wore a truss; always able to return it till to-day. It was found to be temporarily irreducible. Ice was applied, two grains of opium given, and after an interval of three hours it was easily reduced.

CASE 26.—John E—, æt. 40; irreducible scrotal hernia. Traumatic orchitis. Hernia appeared five years ago; has worn a truss. Ice was applied, and Ol. Ricini ʒj given. The bowels acted; there was no constitutional disturbance. He got up on the ninth day, the hernia having much decreased in size, and the swelling of testicle subsided.

CASE 27.—Elizabeth N—, æt. 70; double femoral hernia; right reducible, left irreducible. Hernia on left side existed thirty years, that on the right twenty years; has worn a truss irregularly during last ten years; generally able to return both herself, but two weeks ago failed to return the left; has had slight sickness; no constipation. Ice was applied and Tinct. Opii mxx given. After an interval of two hours the hernia was returned.

CASE 28.—Jeremiah L—, æt. 59; incarcerated femoral hernia. Hernia appeared after injury when eight years old. No truss worn before he was sixteen; always inefficient. On more than one occasion he has been unable to reduce it himself, and for the last twelve years it has never been entirely returned, but he has never had serious inconvenience till three days ago, when swelling increased and vomiting commenced.

He had advice and was given four doses of castor oil, after which the bowels acted once, but the hernia could not be reduced.

Ether was administered, and the hernia partly reduced, after which the sickness ceased.

CASE 29.—Richard C—, æt. 33; strangulated right femoral hernia. This first appeared eight years ago; had no trouble till three days ago, when, after practising artillery drill, he had sharp pain in loins and groins; he had medicine from a chemist, and was seen and examined by two medical men, who sent him some medicine, but, getting worse, he came to the hospital. He has had constipation and vomiting for three days. Taxis was employed for forty minutes on the second day and twice on the third day. Ether was given, the sac opened, and the bowel returned; it was of a purple colour and coated with lymph. The vomiting continued, and he died the next day. At the post-mortem examination it was found that only a portion of the calibre of the gut had been constricted; the bowel was bent on itself and adherent close to the femoral ring. A short distance beyond this, the ileum, instead of being attached by a mesentery, was bound down for about a foot to the parietes by peritoneum, as the cæcum usually is, and this part was unusually narrow; beyond this again it was attached by a mesentery, and terminated in the cæcum, which was floating.

CASE 30.—Sarah F—, æt. 48. Strangulated left femoral hernia, which has existed three years. A truss has been worn irregularly.

Has had vomiting fourteen days, constipation ten days; first seen two days ago by a doctor, who employed the taxis. She was operated on directly after admission,—the sac being opened and the bowel returned. Opium was given; progress favorable till three days after, when erysipelas appeared, and she died on the sixth day.

At the post-mortem examination there was general peritonitis, with puriform lymph formation.

CASE 31.—Sarah K—, æt. 44. Strangulated femoral hernia, which has existed four years. Truss worn till six weeks ago; six days ago hernia came down; three days ago vomiting commenced. Bowels have not acted for six days. Operation performed directly after admission. Sac opened and constriction divided. Bowel of a dark colour was returned. Vomiting continued and she died on the third day.

At the post-mortem examination general peritonitis was found, and the part of intestine that had been constricted was sloughing.

The foregoing cases of hernia do not represent the entire number of patients admitted to beds with hernia during the year, but only those coming under my immediate observation. The concise abstracts given above sufficiently account for the cause of death in the three cases in which an operation was performed. Notwithstanding all that has been said and written of late years,—notwithstanding the urgency with which every one has been requested either to operate, or, if unable, to forward these cases to the hospital immediately, the same old story is repeated. It will be seen that one of these patients had had symptoms for fourteen days, another for six, and the third severe symptoms for three, before being sent to the hospital. In all violent taxis had been applied, in one so severe that the marks of the nails were visible on the skin. Can it be wondered at that they all died? The difficulty that appears to me is this, that in many cases the surgeon who first sees the case is unable to realise its nature, because the patient is not very ill at the com-

mencement. He hopes that, by some fortuitous circumstance or other, the gut may return itself, until day by day passes on, and at last, after repeated taxis, the fact begins to dawn upon him that something more may be required, when the unfortunate patient is seated upright in a cab and jolted over the stones to the hospital. Thus is destroyed the last chance of a successful issue to the operation. The patient's troubles do not always end here ; unconscious of previous manipulation employed, the dresser proceeds to return the hernia by the taxis fortis ; in this endeavour the assistant house-surgeon tries ; next comes the house-surgeon, and he tries ; then, finally, the patient gets to bed, is again placed under the influence of chloroform, and the surgeon makes a last attempt before operating. It can scarcely then be a matter of surprise that such a fearful mortality attends operations for hernia admitted into hospital. Every surgeon must admit that exactly the reverse is his experience of his private cases. It is quite the exception to lose a case of hernia in private practice.

Four cases were not operated on. May it not be possible that many of these cases are seen by practitioners to one case that requires an operation ? If so, it may be some explanation of what looks at first sight gross carelessness—that the one severe case should be lost among the crowd of simpler ones. Charity only suggests this. I would recommend that the existence of nausea should be the test of necessity or otherwise for operation or interference.

Fistula in Ano.

Eight cases ; six males, two females.

In all cases the sphincter ani was divided, the operation being performed in the usual way, a grooved probe being passed along the sinus into the rectum, brought out through the anus, and the probe freed by the division of the parts lying over it. The external sphincter only should be cut, and the patient left with the wound granulating.

CASE 32.—*Calculus Vesicæ ; Lithotrixy.*

(Continuation of Case 35 in "Clinical Records," 1872-73.)

He returned on July 13th, believing a piece of calculus to have become lodged in the urethra.

15th.—Chloroform given, and a fragment crushed.

22nd.—Lithotrixy again performed, after which several small fragments passed.

27th.—Left the hospital free from symptoms.

October 9th.—Symptoms have again returned.

10th.—Lithotrixy.

18th.—Some fragments were removed from the urethra with forceps.

23rd.—An abscess was formed in the perinæum. This was opened. Lithotrixy.

28th.—Lithotrixy.

November 6th.—Several small fragments have been passed. He left the hospital to-day.

January 16th, 1873.—Remained quite well till three weeks ago, when symptoms again recurred. Lithotrixy performed, and he returned home.

March 8th.—Symptoms have recurred.

Lithotrixy on 10th and 20th. No more calculus could be found.

June 30th.—Returned. Several fragments removed with forceps.

July 14th.—Symptoms continue. Lithotrixy once.

21st.—Still has symptoms. Not examined.

CASE 33.—*Calculus Vesicæ ; Lithotrixy.*

John W—, æt. 72, a gardener, living at Basingstoke; admitted September 12th, 1872. Ten years ago was under the care of Mr. Forster for stone. Lithotrixy was then performed on seven occasions, and he has remained free from all symptoms until a month ago, when he again became troubled with pain, scalding, and arrest of the stream of urine. A sound was passed and a calculus detected.

The urine was free from albumen.

September 16th.—Examined with lithotrite; but the bladder being nearly empty, the stone was not caught. Ordered Liq. Morphine ʒj, Aqua ʒss, to be injected into the bladder. To take Potassæ Bicar. gr. x, Sodæ Tart. gr. xx, Tinct. Hyoscyami ʒss, Aqua Camph. ʒj, t. d.

26th.—Examined again.

October 7th and 10th.—Lithotrite passed, but stone not caught.

17th.—Stone caught in two diameters, one of an inch and one of half an inch. He complained of much pain during the opening of the blades. Some débris removed was found to consist of uric acid and carbonate and phosphate of lime.

23rd.—Lithotrite again passed, stone not caught.

28th.—A larger lithotrite passed, which caused less pain. The stone was crushed six times.

November 4th.—Lithotrite again passed, stone not caught. The bladder was washed out with Clover's apparatus, but no fragments came away.

6th.—Has passed several fragments.

He left the hospital, but returned on December 31st.

On January 6th, 1873, lithotrity was again performed, and the stone crushed three or four times.

16th.—Again crushed.

28th.—No fragments detected, so he left the hospital.

May 8th.—Readmitted. Had not been free from trouble since he left. Has to pass water every hour.

15th.—Stone caught with lithotrite and crushed once; it measured over an inch.

20th.—Crushed twice.

29th.—Crushed three times in ninety seconds.

June 2nd.—Crushed three times in ninety seconds.

12th.—Nothing felt in the bladder, so he left the hospital much improved.

CASE 34.—*Calculus Vesicæ; Lithotomy; Cellulitis; Pneumonia; Death.*

Francis C—, æt. 72; admitted May 20th. In June, 1868, he first noticed pain in the region of his bladder. He sought advice, and a stone was detected and crushed once. After this

he passed some fragments and became quite easy, but symptoms again came on eight months ago. He was again sounded, but no stone was felt. He has been gradually getting worse. He appears in fair health; complains of pain in the penis, frequent micturition, and occasional passage of blood, but there does not appear to be any very great distress.

Stone felt with lithotrite, and thought to be a large one.

June 9th.—Stone grasped, and found to be over two inches in length.

The urine was acid, and contained a little albumen. The patient was informed of the great risk incurred by an operation, so he elected to remain as he was. Having much improved by rest, his sufferings were not now severe.

June 19th.—He returned, having suffered so much since he left that he had resolved to run any risk to obtain relief.

June 24th.—Chloroform given and the lateral operation performed; there was very little hæmorrhage. The calculus measured $2 \times 1\frac{1}{4} \times \frac{3}{4}$ inches, was slightly rough on its surface, of a pale brown colour, and weighed 523 grains. No difficulty was experienced in the operation, which was completed in 100 seconds.

The urine escaped freely, but the temperature rose; the scrotum became swollen and dark in colour. Several free incisions were made on the 26th, but he sank on the 27th.

At the post-mortem examination, made by Dr. Goodhart, the lungs were found emphysematous and the bases congested; the heart healthy; the vessels atheromatous; peritoneum healthy; liver fatty; kidneys mottled, with adherent capsule; the pelvis and ureters injected; ureters large; bladder healthy, contracted, not hypertrophied. Incision did not extend quite to the base of the prostate. Connective tissue around sloughing.

Case 32 illustrates how rapidly a phosphatic stone can be formed in the bladder when the slightest piece of the old calculus is left, or it is possible that even a portion of mucus may be the nucleus. I had repeatedly sounded this man, and by the most careful examination had failed to detect the slightest morsel of stone, and yet shortly afterwards he again comes complaining of the return of his old symptoms.

Case 33 had been free from stone for ten years after the first lithotomy. It was then composed entirely of uric

acid, but, I suppose, advancing years and the formation of a small nucleus of the same character had caused a deposition of phosphates; this was, no doubt, the cause of his speedy return to the hospital on December 31st, having left it only on November 6th. He was again admitted in May, having left at the end of January. We can scarcely imagine that on each of these occasions fragments would have been left when they were not left ten years ago, unless there was a tendency to a very rapid formation, such as I have just now mentioned.

Case 34 was hopeless from the very commencement, and I refused to operate. He left the hospital, but returned again, determined to run any risk rather than prolong such suffering. Was it justifiable to operate? I presume a surgeon, consulting his own reputation, would have declined; but I thought it my duty to comply with the urgent request that an operation should be performed, after having fully pointed out to him the slight prospect of success.

The following cases of stricture confirm me in the opinion expressed last year at page 82 of the 'Reports.' We have a smaller number, but the same treatment has been adopted, and with the same good results. I have not had one case in which any necessity existed for perineal section, and this, I believe, merely because of the very patient trial which has been made of catheterism.

Case.	Age.	Duration of disease.	Gonorrhoea.	Injection.	Previous treatment.	Fistula.	Preparatory treatment.	Instrument.	Length of stay.	Remarks.
1	51	13 years	No	No	Catheterism	None	None	4 to 8	13 days.	
2	38	5 years	Yes	Yes	Ditto	None	?	‡ to 8	33 days	Rapid contraction after leaving, and re-admission in May.
3	22	18 months	Yes	Yes	Ditto	None	Hot baths, alkalies, and opium	1 to 8	24 days.	
4	42	12 years	Injury	...	Ditto	None	?	2 to 4	26 days.	
5	47	5 years	Yes	No	?	Yes	?	3 to 9	52 days	Fistula remaining.
6	36	7 weeks	No	No	None	Abcess	Incision in perineum	7 and 8	47 days	Cause of urinary abcess here not settled, and no stricture.
7	49	7 years	Yes	?	Catheterism	Yes	Perineal incision	None	Death on 26th day	Inflammation of kidneys, acute cystitis.
8	57	5 days	Yes	Yes	None	Abcess	Incision	None	10 days	Fistula open.
9	59	3 months	Yes	No	None	Abcess	Incision	1 to 11	48 days.	
10	35	5 years	Yes	No	None	Yes	Baths	1 to 10	13 days	Fistula remained.
11	52	3 years	Yes	No	Catheterism	Yes	Incision	10 to 13	36 days	Fistula remaining, old patient.
12	51	22 years	Yes	Yes	Ditto	Yes	Baths, alkalies, and opium	‡ to 10	58 days	Fistula remaining.
13	22	?	Yes	Yes	?	Yes	?	1 to 10	54 days.	

CASE 35.—Lacerated Perinæum ; Operation ; Improvement.

Eliza P—, æt. 23 ; had perinæum torn during first confinement, four years ago ; since then has had two abortions. The rent was found to have extended just through the surface of the sphincter into the rectum, but the recto-vaginal septum was normal to within an eighth of an inch from the surface.

April 17th.—The bowels having been emptied, ether was administered, and a surface about three inches by one inch was denuded of skin at the posterior and lateral part of the vaginal orifice, and the surfaces brought together with three fine silver sutures ; the knees were tied together, and the patient ordered to turn over on her hands and knees to pass urine.

18th.—Catheter was required twice. Half a grain of opium three times a day.

22nd.—Catheter is used twice a day. There is a purulent discharge from wound.

23rd.—Passes urine without a catheter.

24th.—Inguinal glands inflamed ; has rigors ; edges of incision free from swelling, and apparently united.

28th.—Sutures removed.

May 9th.—Left hospital ; about three quarters of an inch having united, but leaving an opening between it and the anus.

It was originally intended that she should return for further surgical interference, with the view of completely closing the opening which remained between the newly formed perinæum and the anus, but, when subsequently readmitted for a pelvic abscess, the aperture left behind was so far contracted and so small that she suffered no inconvenience and declined any further operation ; nor did I think any necessary.

This pelvic abscess was evidently the result of the operation in the perinæum, attacking apparently the glands at the brim of the pelvis, brought about by absorbent inflammation. It is fortunate that in this case the abscess pointed externally. It now and then bursts into the peritoneum, and, I need hardly say, frequently proves quickly fatal.

CASE 36.—*Cyst with Intra-cystic Growth in Right Breast ;
Tapped twice ; Excision of Tumour.*

Mary A. W—, æt. 37, married, has had seven children, five suckled with both breasts. The sixth refused to suckle the right breast, although nothing abnormal was noticed then, *i. e.* six years ago. The seventh, born two years ago, was suckled with the left breast only ; both of these children died.

The right breast was first noticed to be abnormal four years ago, her attention being attracted by pain in it. A small tumour was then felt. This slowly increased.

On admission, February 3rd.—In the right breast is a globular tumour, 3 by 4 by 3 inches, occupying the central and axillary portions ; no adhesion to skin or parts beneath ; fluctuation can be felt. Glands normal.

February 10th.—Trocár and canula inserted, and a dark brown fluid evacuated, coagulable by heat and containing cholestearine ; a slight nodule left in the deep parts beneath the nipple.

18th.—Swelling reappearing.

March 8th.—Cyst again tapped, and some ounces of dark brown fluid evacuated.

12th.—Ether given and tumour excised, antiseptic dressings used. Wound healed by granulation. Patient left on April 16th, nearly well.

CASE 37.—*Cancerous Tumour of Right Breast ; Excision.*

Sarah C—, æt. 54, married ; had four children, all suckled with both breasts, but mostly with the left.

Two aunts on father's side had tumours of breasts ; one, never operated on, died at forty-nine, the tumour ulcerating. The other had tumour excised, when sixty-nine, by Mr. Forster, two years ago, and is still alive and well.

She first noticed the tumour in her breast twelve months ago ; it has increased rapidly during the last two months ; she has gained flesh lately.

November 11th.—In the right breast is a globular tumour about

three inches in diameter, not adherent to parts beneath, or to skin; nipple normal. Glands normal.

13th.—Ether given, and whole breast excised, the nipple being left; parts adjusted with sutures and pads.

December 16th.—Patient got up, the wound granulating.

21st.—Had a rigor. Erysipelas appeared.

January 6th.—All erysipelas disappeared.

14th.—Left hospital nearly well.

CASE 38.—Cancer of Left Breast, Axilla, and Lung.

Bridget F—, æt. 45, married; had nine children; has had abscess in left breast three times; suckled all children with both breasts. About one year ago, while still suckling her last child, which was then fifteen months old, she noticed a lump in her left breast, which slowly increased. Poultices were applied, and she had medicine since; then the swelling appeared in armpit and rapidly increased. During the last three weeks she has had shortness of breath, and has been unable to lie on right side.

On admission, January 1st.—Looks ill, breathing short; whole of left breast hard and puckered, nipple retracted, surrounding parts studded with small nodules in skin, several of them ulcerated.

Axilla occupied by a hard mass.

Left arm œdematous.

Left side of thorax dull.

January 8th.—Left the hospital.

CASE 39.—Cancer of Left Breast; Excision.

Ann R—, æt. 58. Tumour noticed twelve months ago, increased more rapidly lately.

A globular tumour in axillary lobes of left breast, very hard, adherent to skin, nipple retracted.

Glands slightly hardened in axilla.

February 4th.—Ether given, and whole breast excised.

26th.—Left hospital, wound nearly healed.

CASE 40.—*Cancer of Breast and Liver.*

Mary A. B—, æt. 49, married; had eight children, seven suckled, four with both breasts, last three only with right breast. Had an abscess in left breast after sixth confinement, sixteen years ago, and has not suckled with it since. An abscess occurred also with seventh and eighth confinements; the last ten years ago.

About eighteen months ago she noticed a lump in the left breast above the nipple; this slowly increased for some months; her breathing has been short, and she has been getting thin.

On admission, March 6th.—The whole of the left breast changed into a nodular hard mass, $4 \times 4 \times 3$ inches, involving the skin, but movable over the chest-wall; nipple retracted and ulcerated; glands in axilla enlarged; abdomen enlarged; liver can be felt enlarged and hard, extending to right iliac spine and half way between umbilicus and left iliac spine.

CASE 41.—*Cancer of Right Breast; Excision; Pyæmia?*

Mary A. W—, æt. 36, single. Three years ago struck her breast, but nothing wrong was noticed till three months ago, when a small lump was perceived, which has rapidly increased.

On admission, April 25th.—Is thin, but healthy. In the axillary lobe of right breast is an irregular tumour, not adherent to underlying parts, but involving the skin slightly; glands in axilla enlarged.

29th.—Ether and methylene being given, an exploratory incision was made to confirm the diagnosis, and as it was then seen to be carcinoma, the whole breast was excised, including the skin around the nipple.

30th.—Has vomited. Pulse 120; temp. 102.8° .

May 1st.—Tongue dry and furred. Pulse 150; temp. 103.8° . One suture removed; poultices applied; a little blood and pus escaped; surface above very red.

2nd.—Pulse 120; temp. 102.8° .

3rd.—Pulse 120; temp. 101° .

4th.—Pulse 108; temp. 99.4° ; expectorates pus.

5th.—Pulse 100 ; temp. 99·2 ; redness fading.

6th.—Pulse 120 ; temp. 102°.

7th.—Pulse 128 ; temp. 104° ; free discharge.

8th.—Pulse 128 ; temp. 102·4°.

9th.—Pulse 126 ; temp. 103·4° ; swelling, pain, and redness of left wrist ; thinks she has taken cold.

10th.—Pulse 136 ; temp. 104°.

11th.—Pulse 140 ; temp. 103·6°.

12th.—Pulse 152 ; temp. 103·4° ; wound free from redness. Left hand and forearm more swollen.

13th.—Went home in consequence of the unhealthy state of the ward. The wound was still discharging ; united at parts only. The left wrist and hand considerably swollen and tender. She went home to Folkstone and subsequently died.

CASE 42.—Cancer of Left Breast ; Excision.

Emma B—, æt. 46, single. Tumour first noticed four months ago ; has slowly increased. In the left breast is a tumour $4 \times 4 \times 2$ inches, very hard, adherent to the skin, but not to parts beneath ; nipple retracted ; glands in axilla enlarged.

June 30th.—Bichloride of methylene given and followed by ether. Breast excised by elliptical incisions ; edges adjusted with sutures.

August 20th.—Left with wound granulating.

Of the whole number, seven, only one was an innocent growth ; that was an extremely interesting specimen of a cystic tumour, the cysts containing, as usual, a large quantity of cholesterine. But few of these cases are relieved without the operation of removal of the whole cyst. This was tapped twice before I resorted to this expedient. It is questionable whether in some of these cases they may not be more or less of a cancerous type, as I have known after some years a recurrence of the tumour in a more solid form. They must be carefully distinguished at their commencement from cysts connected with malignant disease ; but those are usually smaller and are multiple, whereas these cysts are of a large size and isolated, with the surrounding breast structure healthy, whereas the surrounding tissues in malignant disease are infiltrated and altered in their character. Of the remaining six cases of cancer, four only were operated on ;

one of these died of pyæmia at home. In two, disease had so far advanced and complicated other organs that surgical interference was not warranted.

CASE 43.—*Disease of Left Shoulder-joint and Right Tibia after Acute Rheumatism ; Amputation of Thigh.*

Frederick H—, æt. 16, a tailor, was admitted into Luke Ward on March 26th. His father and mother are still living. There is no history of rheumatism in the family. A sister has died of consumption. No previous disease or injury. Nine months ago he had rheumatic fever ; had swollen joints, and was ill three or four weeks. During recovery the right leg became swollen, and soon after openings formed. He has kept his bed from the first. In December of last year the left shoulder became swollen and painful, and soon after openings formed, which have continued to discharge.

On admission he looks ill. The upper half of right leg is swollen, the bone apparently thickened, and several sinuses discharging. The knee-joint is swollen and movement limited. No acute inflammation. The left shoulder is swollen and several sinuses are discharging. Movement much limited. Heart sounds normal.

I judged it best at first to do no more than remove any pieces of bone that I might find diseased, since he was in such a bad condition. Accordingly on April 1st ether was administered, and four or five small pieces of bone were taken from the tibia. This left a somewhat large excavation in the head of the tibia, and from his feeble power of repair the operation proved too much for him. Extensive and offensive suppuration started in the parts around, and I was obliged to give him a last chance on April 29th by amputating through the thigh. He, however, died of pyæmia six days later. He had suppurative myocarditis, with double pleurisy.

CASE 44.—*Syphilitic Necrosis of Calvarium ; Removal of Bone ; Erysipelas ; Death.*

George M.—.æt. 29, was admitted on November 6th, 1872. Eight years ago he had venereal sores, swelling in penis, eruption, and sore throat. He got well under treatment. Was never salivated. He has had occasional recurrence of rash and sore throat.

Three years ago he first had pains in head, and at intervals since to March, 1872. A swelling on the head was opened, and it has discharged ever since.

When admitted he looked fairly healthy, though dull and stupid. At the upper and posterior part of right parietal bone is an opening in the soft parts one and a half inches in diameter, exposing dark-coloured bone. The soft parts are undermined, and a second opening exists behind the ear, through which loose bone can be felt. The occipital bones feel slightly irregular ; tissue normal ; skin free from eruption, except a few scars on the legs. Glands slightly indurated in inguinal and axillary, but not in cervical region.

On November 11th ether was administered and some bone removed. Several pieces were taken away, comprising the whole thickness of the skull. They measured, together, three and a half by two and three quarter inches ; the largest single piece was one by two and one eighth inches. They were greenish, offensive, and soft, were not quite loose, and had to be broken away from the surrounding cranium by the forceps. No other instruments save forceps and elevator were used. He progressed well for three months, except that his urine became albuminous. He then got erysipelas in the head and died.

At the post-mortem Dr. Moxon thus reports :

There is an excavation over right parietal region, exposing the dura mater, which is covered with a foul-looking thick layer of granulations ; bone wanting over a space the size of the palm, and around this were many patches of dead bone, but separate and beyond this, the bone was inflamed, at parts covered by granulations, at parts hard and ivory-like. Scarcely any part of the inner surface was healthy.

Brain and its membranes healthy.

Thyroid lardaceous. The peritoneum was in a state of acute

suppurative inflammation. Stomach and intestines lardaceous. Liver amyloid. Supra-renal capsules lardaceous. Kidneys lardaceous.

Of ten cases of necrosis, the only ones that call for any lengthened notice are those of a boy, who, as far as can be learnt, really suffered from acute rheumatism, not pyæmia, and the rheumatism terminating in osteitis, it was followed by necrosis. The other was one of those severe cases of syphilis attacking the bones. Of the former case it need only now be said that it lends additional force to the remarks made in a former part of the paper on the connection between acute rheumatism and destructive joint disease. Of the latter class of cases, it may be said that they almost invariably terminate in death, if not from pyæmia or erysipelas, then from the extensive nature of the disease; either the bone cannot be all removed, and they die of lardaceous viscera, or if, as in two cases that have occurred to me, it, though extensive, is capable of removal, the subsequent contraction of the cicatrix in the scalp causes death by pressure on the brain.

Two other cases may just be mentioned, one, that of a boy, æt. 13, who received an injury to the ribs eight months previously. He came under notice with a sinus and necrosis of the bone, and a portion of rib, comprising its whole calibre, four inches in length, was removed. The other was a case of necrosis of a portion of the epiphysis of the ilium in a child eight years old. Her temperature seemed high, though treated antiseptically for more than a month.

Four cases of talipes have been treated. Of these, one was talipes equino-varus, double and congenital, in a male two months old. The tendo Achillis and tibials were made tense in each foot on attempting to correct the deformity. The former tendon only was divided subcutaneously in both, and the position corrected by strapping, and subsequently by splints; the child was seen several months after, much improved.

Two were cases of talipes equinus. The first was of the right foot, in a female, fourteen years of age. The deformity was first noticed when three months old, no treatment having been adopted at that time. The whole limb was ill-developed. The tendo Achillis was divided, and Scarpa's shoe applied. She

left improved, and returned three months after, walking well, having worn the splint till then. It was now finally omitted. She is to have a thick-soled boot. The other case was of the left foot, in a male, four years old. This was cured by use of a splint only, in five weeks.

A case of talipes valgus of both feet (moderate) in a male, aged fourteen, was improved by use of Scarpa's shoe.

Injuries.

Seven cases of scalp wound, complicated with injuries more or less severe, required admission into the hospital. The following is worthy of a somewhat detailed account, from its symptoms, partially hysterical and partially indicative of serious mischief. It would be difficult to say which had the predominance, whether, as Sir James Paget would express it, there was a nervous mimicry of brain lesion or a definite lesion itself.

Of concussion of the brain seven cases were admitted, one being of considerable interest, in that it was associated with aphasia, the man recovering after a somewhat prolonged stay in the hospital.

A case of concussion of spine was admitted after an injury to the back in a girl of 15, exhibiting a similar difficulty of diagnosis as in the preceding case, and, judging from the rapid recovery, was more hysterical than real. Though, if it be once admitted that a corresponding injury to the cord with that which we see in the brain, and call concussion, can occur, this may be admitted to be of the same nature as the brain bruising, whatever the exact pathological change that takes place may be.

Case 48 was of interest from the rarity of the accident, and the care which was taken to pull down the muscles and accurately adjust the divided ends. It is a question how far firm fibrous union takes place in these cases, and whether they can be likened to corresponding injuries to the tendo Achillis. My impression is, that by careful coaxing of the extensor muscle the ends were so far brought into contact as to form a very perfect union, and though when the man left the hospital we had not allowed him to bend his leg to any extent, it still seemed to bear the little flexion that was attempted without much evidence

of stretching. The utmost vigilance was required to keep the muscles down, and the strips of plaster required frequent re-application. To the careful attendance of my dresser, Mr. Hetley, is due the happy issue of the case.

CASE 45.—Injury to Head ; Brain Symptoms.

Anna W—, æt. 21; admitted May 26th. About 4 p.m. on May 23rd a bag of cork and an iron hook fell on her head, causing a wound of the scalp and insensibility; she was taken to the hospital, where the wound was dressed; she was thought to be hysterical, and was sent home in a cab; she remained in a semi-conscious, wandering, restless state. She was brought to the hospital the next morning, walking part of the way; the wound was dressed, and she returned home. She remained in bed till 26th, becoming more excited and less conscious; she was again brought to the hospital, walking all the way (more than a mile), and was sent into the ward.

The wound was reopened with a probe, and a little pus escaped; she lies in a restless semi-conscious state, has delusions, but complains of pain in her head, and answers tardily when repeatedly spoken to; there was no paralysis. Temperature 99.7°. Catheter required; purge given; milk diet; ice to head. She slowly recovered perfect consciousness, and on June 7th the temperature was normal; she was then allowed to sit up and have some meat. She was discharged well on June 18th.

CASE 46.—Concussion of Brain ; Aphasia ; Fracture of Base of Skull (?).

William H—, æt. 35; admitted January 4th. He had fallen from a ladder twelve feet, after having been drinking. He was unconscious, and had a bloody discharge from his right ear. Pulse 120; temp. 102°. Pupils dilated, the right being larger. Consciousness slowly returned; sensation and motion not impaired; urine passed naturally. Speech confused and tremulous; appears to understand, but does not give an intelligible answer; he attempts to speak, but mutters, and ends by repeating "to-

gether," "gethering," &c., with slight variations; cannot tell his name. At the end of a week there was very slight improvement in his speech, and there appeared to be some loss of power in both hands; appears unable to protrude his tongue. Hears watch with left ear at seven inches, but with right only at one inch. If shown any object and asked to name it, he repeats "Yes, I think so," "Yes," and no other answer can be elicited even after prompting.

After this he slowly recovered, and left nearly well on January 30th.

CASE 47.—Concussion of Spine.

Sarah T—, æt. 15, a servant; admitted March 3rd. While alighting from a tram-car in motion on March 2nd she fell on her back; being unable to stand or walk, she was carried home and put to bed; she complained of pain at lower part of back and was unable to move her legs; the legs were numb for a little while; no difficulty in micturition.

She was brought to the hospital in the recumbent position, still complaining of pain in her back and inability to sit up; otherwise quite well. Sensation and motion normal in legs; could turn over on side; pain was localised to dorso-lumbar region, and the skin near was hypersensitive. She quite recovered and walked out at the end of five days.

CASE 48.—Laceration of Extensors of Thigh at insertion into Patella by Muscular Action.

Michael F—, æt. 56, a deal porter; while carrying a load of deals, the plank on which he was walking yielded. This disturbed his balance and made him stoop; in endeavouring to recover himself he felt something tear slowly just above his right knee. He then rolled off the plank on to a barge just below, and the knee became bent. His comrades straightened the limb, and brought him to the hospital.

On admission.—A hollow could be felt just above the right patella. There was some fulness at the upper and front part

of the thigh. The vasti were very rigid, more especially the outer.

A back splint was applied, two long strips of strapping were fastened along the front of the thigh, and five pounds' weight attached to their lower end.

He was discharged in eight weeks with a stiff leather casing around the knee.

Fractures.

The following cases have been admitted during the year.

Fracture of skull, compound depressed	1
„ „ with laceration of meningeal artery	1
„ bones of face	1
„ spine	3
„ ribs	4
„ olecranon, compound	1
„ pelvis	1
„ femur—	
„ neck, extracapsular	2
„ „ intracapsular	1
„ „ through trochanter major	1
„ shaft	9
„ patella	3
„ leg, tibia and fibula	22
„ „ tibia	6
„ „ fibula	5
„ bones of foot	4
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The fractures of the skull were both interesting cases; that of the frontal bone because it raised the question of surgical interference. The history was shortly this:

John S—, æt. 41, was struck with a swing above the right orbit; the wound bled freely. He was not stunned, and walked to the hospital; when admitted he was quite sensible, but had a wound an inch long over the right side of the frontal bone. The bone was fractured and depressed a little at the outer third of orbit. The right pupil was larger than the left, but he had no paralysis.

The question that arose was one that has often been

discussed, but is now, I believe, pretty thoroughly understood by those who have seen many cases of injury of the skull to be not so debatable a question as it was in former years. In a man with fractured skull and depression, and without head symptoms, such a one as this patient, ought the depressed bone to be raised? This must depend very much upon the position of the fracture, the kind of blow received, and the practical tact which the surgeon can bring to bear, as to the probable extent of depression of the inner table. Thickness of the skull is also a matter for consideration. In the case now before us the depression did not seem to extend to the internal table; moreover, it was at the outer side, at the extreme end of the frontal sinus, and I determined to wait until the slightest appearance of cerebral disturbance took place. It appears that our caution was justified by the results; but it by no means follows that some time hence we may not be called upon to use the trephine to raise a piece of depressed bone for secondary disturbance of the brain surface, occasioning epilepsy or some of its allied diseases.

In connection with this subject there have been several cases of bleeding from the ear, associated with subconjunctival ecchymosis after injuries to the head.

Now, cases such as these would seem at first sight very serious, but apart from threatenings of evil no harmful result accrued to any of them.

They also raise the question of the respective value of the symptoms usually considered characteristic of fracture of the base of the skull. They may be placed thus in their order of relative importance:

Escape of clear fluid from the ear.

Subconjunctival ecchymosis, if the fracture be in the orbital plate of frontal bone.

Greater or less disturbance of the mental functions, generally on the side of diminution rather than excess of function.

Pressure symptoms, such as paralysis.

Bleeding from the ear.

Deafness.

Of these only the first is unfailing. If there is no mistake about it, the diagnosis is certain, but care should be taken that a serous fluid is not called cerebro-spinal.

The value of any one of the others will vary according as it is

very marked or is associated with one or all of the remaining symptoms.

The most frequent case of difficulty coming under note is such as this:—A man receives an injury to his head, and he immediately bleeds freely from both nostrils, and also from the right ear. He may or may not be insensible, but is generally so only for a very short time. He is discharged three days after admission well. Was this a case of fracture of the base? Many, I among the number, would say no. Still, at the same time it must be remembered that our method of argument in these cases is hardly sound. We take the worst cases, in which perhaps all the symptoms we have enumerated are present, and call it fracture of the base of the skull. That case is certain to appear on the post-mortem table, and to a certainty we can predicate of it that the base of the skull is fractured. It is so, and we turn away from it to other cases of similar nature, and reason thus; we come, in fact, to this: Certain symptoms are always associated with or followed by death; death in these cases is the result of a certain fracture; therefore, the said fracture is always fatal.

It is obvious that the premises here do not satisfy the conclusion, since the terms are not equivalent; all we can say is, that some fractures are not always fatal—that proposition no one should deny.

But, further, a patient having all of a set of symptoms, he will die; one with less will get well, and between these extremes there is no mean. Is it that we are left almost without an opportunity of clearing up the difficulty? But why do fractured bases die? Is it anything in the peculiarity of the fracture? No; they die in nine cases out of ten, firstly, because the brain is so bruised that it is incapable of keeping up the requisite functions required of it; secondly, because inflammation extends to the membranes of the brain. I suppose, however, that it is quite possible to fracture the skull without injuring the brain, provided that no great amount of momentum be imparted to that organ by the injury, just as the steam hammer will crush the nut without injuring the kernel—to make use of a familiar illustration.

The skull, then, being alone fractured, we might expect bleeding from the ear, and even cerebro-spinal fluid, without any

brain symptoms, at any rate during the first days following the injury. Now, if the brain case were bone other than it is, we should then probably fall into the secondary dangers of inflammation and surface irritation, due to the formation of new bone for repair; but, as is well known, hardly any new bone is produced in the skull, except a slight surface bony casing along the line of fracture, and a bone cement between the two adjacent fracture edges. Supposing, then, from the absence of callus, we get at any time a fracture of the base without brain-bruising, we may reasonably expect such a case to get well with no further symptoms. Thus it is quite possible, one would think, that a certain proportion of cases of hæmorrhage from the ear are of this nature. A word of caution should be added in conclusion as to the treatment of a fractured base; if, as has been suggested, such a case is often saved by the non-formation of callus, the absence of it shows the slow formation of bone, and the time the skull takes in repairing its breaches. This fact is well shown in a case of mine, published in vol. xxiv of 'Path. Trans.,' p. 175, where a patient died ninety-one days after receiving a severe fracture of the base of the skull with other injuries, and at the post-mortem at only one spot was there any evidence of union.

In cases, then, of supposed fracture of the skull, I would say, be very slow in departing from the low diet, which should, of course, be prescribed for them when they come under treatment, and be very chary of allowing them much exercise for some time after they are apparently quite well.

CASE 49.—Compound Fracture of Olecranon, and Recovery, with Movable Joint.

Joseph J—, æt. 46, fell on his left elbow.

On admission, November 8th, 1872, was found to have a compound fracture of the left olecranon.

A straight splint was applied on inner side of arm and flexor side of forearm, with a pad to keep the elbow slightly bent. This was changed for a rectangular front splint, which was continued for a month. He was discharged on December 24th, able to move the joint without pain, but a sinus still existed.

The grave question that always arises in these cases is as to the proper position in which to fix the limb; and though, perhaps, for the first few days the straight position of the limb is the more comfortable, the future usefulness of the member is the great object to be kept in view, and for this purpose the flexed position is certainly the most useful. Despite, therefore, of any extra pain, swelling, or inconvenience, this one object should be kept steadily in view, and, if necessary, chloroform must be exhibited, so as to get the elbow to a right angle. This plan was adopted within a week of the man's admission into the hospital, and the result showed that, notwithstanding the violence that must necessarily have been adopted in flexing the limb, still, when the whole had repaired, he had a fair amount of movement.

CASE 50.—Disease of Left Knee-joint; Excision.

Elizabeth W—, æt. 19; a healthy girl; never had rheumatism. Seven years ago she fell and injured her left knee. After resting for a week she got about, but, twelve months after, the knee began to get stiff; she continued to walk about till fifteen months ago, when she tripped and forcibly bent the knee. Since then she has not been able to walk, but has not been in much pain. Splints have been worn for three months.

On admission, July 17th, 1872.—The left knee-joint is generally swollen. The patella is movable, and there is very little pain on manipulation. There is increased heat. Movement is limited from 180° (straight) to 140°, and is accompanied by grating. There is no displacement of tibia.

A straight splint was applied and the joint blistered repeatedly, after which the swelling subsided a little, but there was much starting of the limb at night. Ordered Pulv. Doveri gr. viij o. n.

August 24th.—The startings continue; bag of ice applied.

September 20th.—Still has starting at night; was examined under chloroform to-day.

October 17th.—Chloroform given and joint excised; the patella removed, the articular surfaces of femur and tibia removed; a second slice of tibia removed on account of an abscess being exposed. Eight ligatures, box splint, antiseptic dressings.

Temperature varied from 101° to 102° till the 26th, when water dressing was substituted for antiseptic dressings. The temperature rose to $104\cdot3$ on 27th, and then slowly subsided to normal by November 12th. The discharge diminished, and she was able to get up on January 17th, with a stiff bandage. This was removed as required, and on May 9th she left the hospital with the bandage on, the sinuses still discharging on each side of joint.

Bones apparently united and in good position. She is able to bear a little weight on the limb.

CASE 51.—Disease of Knee-joint ; Excision ; Death from Pyæmia.

Annie O—, æt. 17, a domestic servant ; four years ago had scarlet fever ; has much kneeling to do ; no injury known of.

Fourteen months ago she noticed that her left knee was swollen ; iodine was applied, and it improved a little, but during the last three months it has been getting much worse, and she is scarcely able to bear any weight on the limb ; the limb also starts at night.

On admission, March 26th.—Is in good health. The left knee is swollen and hot ; there is fluctuation in the joint, slight flexion, displacement backwards, and rotation outwards of tibia. A straight back splint was applied.

April 29th.—Ether given and excision performed by a single curved incision. The soft parts were gelatinous, and the cartilage eroded at one spot on each condyle of the femur ; the bone rather soft ; put up in a box splint. Two hours after, hæmorrhage came on, an anæsthetic was given, and the whole reopened ; two vessels twisted. There was hæmorrhage also from the sawn surface of bone, to arrest which the surfaces were firmly pressed together, the wound sewn up, and pressure applied ; slight oozing continued. The patient was blanched and collapsed, and vomited severely at night ; at night the temperature was $95\cdot6^{\circ}$; pulse 140.

30th.—Temp. 97° ; pulse 160 ; vomiting continues ; catheter required.

May 1st.—Pulse 140 ; temp. $101\cdot8^{\circ}$; vomited once.

2nd.—Pulse 140; temp. 102.8° . Evening, pulse 136; temp. 103.2° .

3rd.—Pulse 136; temp. 102.4° ; nausea.

4th.—Pulse 160; temp. 104.2° .

5th.—Pulse 144; temp. 103.2° ; abscess over tibia; vomiting again.

6th.—Pulse 144; temp. 101.5° .

7th.—Pulse 125; temp. 101.2° ; abscess opened with forceps passed in through wound.

8th.—Pulse 144; temp. 100.5° ; counter-opening made.

10th.—Pulse 160; temp. 99° . Died at 10 p.m.

At post-mortem examination.—Lungs: right, numerous pyæmic patches; left, small cavity and a few grey tubercles. Heart: vegetations on mitral; softening clot in left ventricle.

CASE 52.—*Small Round-celled Sarcoma on Head of Right Humerus; Amputation through the Shoulder-joint.*

David M—, æt. 15, no history of tumour in family; has worked hard in a warehouse, often carrying loads on his right shoulder. Has always appeared healthy.

Six weeks ago he first noticed aching pain and swelling in right shoulder, which has increased rather rapidly.

On admission, April 23rd, 1873.—Says he feels well, but looks pale. The right shoulder is enlarged, the swelling extending to six inches below the acromion, measuring 13 inches obliquely around axilla and acromion, compared with $11\frac{1}{2}$ on left side; and $13\frac{1}{2}$ inches horizontally around just below axilla, compared with $9\frac{1}{2}$ on left side.

The swelling is elastic and globular, but appears to affect chiefly the outer part of the head of the bone. The skin over it is thin and the veins distended, but the soft parts do not appear to be infiltrated. The head of the bone moves freely in the glenoid cavity, and the range of motion does not appear to be impaired. The clavicle, acromion, and neck of scapula appear normal.

The glands in the axilla are not enlarged.

May 13th.—The swelling has increased.

The boy was anæsthetised with bichloride of methylene, followed by ether, and I explored the tumour by raising a flap from the outer surface, but, finding excision of the growth

even with the upper part of the humerus impracticable, I disarticulated and removed the limb, making a short internal flap.

The subclavian artery was compressed above the clavicle, and the inner flap grasped as soon as cut. The axillary and three or four other vessels were secured by torsion. The flaps were then adjusted by sutures.

The upper part of the shaft of the humerus was surrounded by a growth which invaded the whole of the soft tissues, and on making an antero-posterior vertical section the growth was found to extend from the greater tuberosity downwards for five inches, and to measure three inches transversely. The epiphysis appeared normal, and the epiphysial cartilage healthy, but immediately below this the shaft seemed involved, the outer compact layer being indistinct near the head, the interior being mottled, and below this the shaft was occupied by growth in its interior, as well as surrounded by growth on its exterior, a distinct white membrane being visible in the growth, about a quarter of an inch from the bone, apparently representing the periosteum.

Below the area of the growth the bone appeared dense, and the periosteum much thickened.

The growth seemed to spring from both surfaces of the periosteum. It was soft, yet firm and striated, and mottled white in colour. It invaded all the tissues.

Under the microscope it resembled a small, round-celled sarcoma.

The boy progressed favorably. His temperature rose to 104° F. on the day after operation, and then gradually went down to normal on the tenth day, when he got up. The wound was then united at each extremity, but a copious purulent discharge escaped from an aperture in the centre. This, however, gradually became less, and on the twenty-eighth day he went to a convalescent home, the wound being almost healed, and his general health much improved.

CASE 53.—*Elephantiasis Arabum of Right Leg ; Suppuration ; Incisions ; Amputation through lower third of Thigh.*

Joseph H—, æt. 67, a grocer. General health good ; has had gonorrhœa, but no other form of venereal disease ; has led an active life, and has lived well till lately ; has taken beer and spirits occasionally at night.

About twelve years ago he first noticed a solid red spot come on the front of the right leg, just above the ankle, corresponding to the top of the boot ; some months after, this became painful, and spread upwards like a red inflammation. He had advice, but did not improve ; the leg was swollen, but not the foot ; it varied slightly, but never became normal ; there were no enlarged veins. Two years ago, while walking, without any injury, bleeding commenced from near the original spot. He states it bled half a pint. He kept his bed three weeks, and the place healed. Since then the foot and leg have become more swollen, and from the fissures a brown, watery, offensive discharge has issued. He has been slowly getting worse. During the last two weeks the parts have become dry and scaly.

On admission, January 6th.—He is thin, but fairly healthy.

The right leg is swollen from the knee to the toes ; the skin is thickened, brownish-red, and at parts scaly, at others red and tuberculated ; the foot is tender.

The glands are indurated in the right groin and slightly in the left, but not in the axillæ or neck.

The leg is raised on a splint.

January 28th.—Blistering fluid applied to the thickened parts on outer and upper part.

February 28th.—An abscess formed on the front of the leg at the centre. An incision was made two inches long ; the pus is beneath half an inch of soft parts, but superficial to periosteum.

March 14th.—Another incision made.

25th.—Ether given and amputation performed at the lower third of the thigh by lateral flaps ; vessels secured by torsion ; sutures inserted.

26th.—Hæmorrhage occurred, and the flaps were opened and a vessel twisted.

April 14th.—There is a considerable gap between the flaps ; surfaces granulating ; bone exposed.

May 8th.—Gets up daily ; bone still exposed.

22nd.—An attempt made to remove the bone with forceps without success. An incision was made in the anterior flap and pus evacuated.

June 18th.—Discharged. A sinus still open and some bone bare.

October.—Returned, and several inches of the bone were removed with forceps by Mr. Howse.

The foregoing cases, two of excision and two of amputation, are the only ones worthy of record, that have occurred during the last year. The first case was protracted in recovery owing to the extraordinary obesity of the patient, and the consequent difficulty in ascertaining the position of the bones. A protracted suppuration seemed rather to increase her bulk than diminish it, and I was loth to allow her to bear her weight upon her limb for some months longer than I should have allowed in the case of a thinner patient in making her first attempt at walking. Since her return to her native country I believe she has not progressed, probably owing to deficient nourishment and the want of attention such as she received in the hospital, though when she went out she was able to bear her whole weight upon the limb.

Of the second case, the rapid death from pyæmia was a termination which could scarcely have been foreseen, though perhaps by some it might have been thought to be provided against by adopting the antiseptic treatment. It would be difficult to say it could ; it would be absurd to maintain positively it could not. Considering what a free cut is made into the cancellous structure of the bone, it is surprising that such a complication does not more frequently arise. Yet this is the first instance that has occurred to me in excising any of the bones.

The interesting case of amputation at the shoulder-joint is well worthy of perusal. The patient has, however (November),

again made his appearance; the growth has rapidly returned, a mass springing from the axilla as large as the two fists.

The propriety of amputation through the thigh for elephantiasis will doubtless be questioned; but it will be seen from a careful perusal of the case that, for more than two months previously, blistering and other plans of treatment were tried without success, and amputation seemed to afford the only prospect of a speedy relief of his trouble.

I am unable to conclude the record of these cases without adverting to the practice which I have during the last year requested the house-surgeons to adopt, whenever an anæsthetic has been required to my patients, viz. to give chloroform to the very young and old, bichloride of methylene followed by ether, or the latter alone, to all others, in whatever period of life they be. The experience of the various house-surgeons as to the effect produced varies considerably, some speaking of it very highly; others, on the contrary, though not condemning it, thinking it of doubtful value over chloroform. There is no question about the great expense of the exhibition of ether, a very large quantity and a special apparatus being required, since the ether vapour should be inhaled without the admixture of air. It is necessary also that one or two able assistants should be at hand, for the struggling is usually very violent, and this recurs again after the patient has been operated on, so that much disturbance, accompanied with shouting and yelling, will sometimes continue for half an hour or more. I am bound to say also that in one or two cases the ether seemed to fail, or, at all events, after being continued for some time (twenty minutes or more), it was abandoned and chloroform substituted. The usual length of time for most cases is ten minutes, the shortest three and a half minutes. It was owing to this uncertainty in its action that for minor operations, and in the theatre sometimes, chloroform had occasionally to be substituted. This occurred chiefly in the colder weather, and might have been avoided by placing the ether in a vessel warmed to a higher temperature than the surrounding air. In all, a decided acceleration of the pulse was noted, but without any noticeable loss of volume or strength.

In almost all the cases there was a great increase of secretion in the mouth; the mucous membranes were irritated, and thus

mucous râles were created, especially in the respiratory tract. This appears to be quite transitory, and disappeared with removal of the ether. It has been said that no vomiting occurs when ether has been administered; in several cases it has been excited, though I do not think it lasted so long as after chloroform.

Upon the whole, if there is a little more expense, if there be a little more trouble or any other inconvenience, they are all as nothing compared with the sense of security which I have always felt when ether was being administered instead of chloroform. I should certainly at all times be induced to give it a preference. I do not mean to say that chloroform should never be exhibited, because I think, with scrupulous attention to the patient alone, on the part of the exhibitor,—the entire exclusion of everything from his mind except the anæsthetic effects upon the patient, and if he totally disregards the steps of the operation, it may in the hands of a careful chloroformist be as safely administered as ether; still, it is scarcely possible to so entirely withdraw one's attention from the operation as not to run the slightest possible risk by the administration of an overdose of chloroform. This is an argument in favour of a chloroformist being engaged at each hospital, though the advantage gained to each house-surgeon in the absence of such official more than repays in practical experience distributed throughout the world for an occasional source of anxiety, and perhaps once in a few years, though this is questionable, a death.

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ON THE
STATE OF THE CIRCULATION IN ACUTE
DISEASES.

BY A. L. GALABIN, M.D.,
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(Communicated by the Editor.)

THE attention of all observers who have made use of the sphygmograph has been hitherto directed rather to its clinical application as an aid to diagnosis and prognosis than to its employment for the solution of any physiological problems relating to the vascular system. This has been inevitable from the confusion which has prevailed among physiologists as to the explanation of the waves seen in the sphygmographic tracing, and the inherent difficulty of the mechanical theory of the pulse. Yet the sphygmograph would probably have its greatest value as applied to such general questions, rather than as an addition to the ordinary means of clinical research, since, however valuable its indications often are in reference to individual cases, its employment requires an expenditure of time which but few persons would be able to bestow.

In the 'Journal of Anatomy and Physiology' for November, 1873, I have discussed the cause of the secondary waves of the pulse, and in the present paper I shall assume the results there obtained, so far as concerns their practical application; for, although my view differs from that hitherto most generally received as to mechanical causes, yet as to the inferences to be drawn, with regard to the state of the vessels and the mode of

action of the heart, it is not inconsistent with it. There are two secondary waves whose interpretation is practically important—the first secondary or tidal wave, and the principal secondary or dicrotic wave. As to the tidal wave, I believe that its separation from the primary wave is due to acquired velocity in the sphygmograph, which causes the first pointed summit, or so-called “percussion-wave,” to rise above the level of the true pulse-wave. I agree, however, with most writers in considering that the expansion of the tidal wave does actually denote a prolonged flow of blood, and therefore a protracted contraction of the heart, and that in many cases it nearly coincides with the corresponding part of the true pulse-wave. Experimentally its development is found to be increased, both by increase of tension and by diminution of elastic distensibility, both which conditions tend to make the heart’s action more slow and laborious.

The relative magnitude of the tidal wave, as compared with the primary, is greatest in arteries near to the heart, such as the carotid, and becomes less on approaching the periphery. Thus, in a healthy pulse, in which the tidal wave in the radial artery is small, it may be absent in the arteries of the foot, but it remains very manifest there in the pulse of atheroma or of Bright’s disease. In that case it follows the primary wave at about the same interval as in the radial, but in pulses in which it is small from the first, in receding from the heart it tends to become lost upon the preceding primary wave, a change which is just the opposite to that which would occur if the common theory were true, that it is a wave transmitted in the artery with a less velocity than the primary wave. This change of relative magnitude results from a change in the shape of the true pulse-wave, which is analogous to that in a wave of the sea as it reaches the shore; for in that case the wave velocity is greater the greater the depth of water, and thus the crest of the wave outstrips its base, until at length it curls over and breaks. Similarly in the pulse the wave velocity is greater the greater the tension, and therefore the crest of the pulse-wave moves rather more swiftly than its other portions. Thus, as the wave proceeds, its front retains its steepness, or grows even steeper, but the slope of its descending curve becomes more gradual, and thus the tidal wave, which then comes to correspond with this

descending curve, shows a gradually diminishing magnitude as compared with the primary.

The primary wave, when separated from the tidal, denotes the steepness of front of the true pulse-wave, and, therefore, by inference, the initial vigour of the heart's contraction. I do not, therefore, greatly object to the term "percussion-wave," which has been commonly applied to it, although I believe that no percussion takes place except in the communication of motion from the artery to the sphygmograph, and that what occurs even there is not percussion, in the strict sense of the word.

As to the dicrotic wave, I think that the common theory, which attributes it to a recoil produced by the closure of the aortic valves, is only partially true, and that two causes mainly contribute to its formation. The first of these is a recoil from the aortic valves, as the common theory supposes. I think, however, that, as to the mode of origin of this, sufficient regard has not generally been paid to the effect of the inertia of the fluid. It is evident that all changes of state in the aorta close to the valves will be propagated as waves to the periphery, although these waves may become modified as they proceed. Considering, then, the state of things in the aorta near to the valves at the moment that the ventricle ceases to contract, the blood will for an instant continue to flow away in consequence of its acquired velocity, and, the propelling force behind having ceased, the pressure will fall. As soon as the acquired velocity is checked by the pressure in front there is a slight retrograde motion, which closes the aortic valves, and, being reflected from them, causes a second forward wave of increased pressure and expansion.

The preceding retrograde motion and fall of pressure is also as a wave propagated forwards, although the motion of individual particles is at first backwards, and thus it does not involve any reflection from the periphery. As soon as it has proceeded a short distance from the heart it consists no longer of any actual retrograde movement of particles, but only of a diminution of forward velocity.

Since, therefore, the fall and subsequent elevation of pressure, which constitutes the first cause of the dicrotic wave, depends on acquired velocity in the fluid, dicrotism is increased if the density of the fluid be increased, or if the tension in the

tubes, by which such velocity is checked, be diminished. In the latter case there will be a longer interval between the cessation of the heart's contraction and the second rise of pressure. Thus, the commencement of the dicrotic wave corresponds to a point always an instant later than the end of the systole, but this instant is a shorter one in a pulse of high tension than in one of low. Even in the absence of the aortic valves it is conceivable that the retrograde movement of fluid, meeting with the onward flow from the auricle, might cause a second rise of pressure, to be again transmitted as a forward wave of expansion. In that case, however, it could hardly call out a descending series of similar waves, which may happen if the first reflection occurs from elastic valves.

Such is one cause of the dicrotic wave, and it will be seen that even this does not depend solely upon the aortic valves, but that it is an oscillation or forward and backward movement, due directly to the inertia of the fluid. But there are several reasons for thinking this cause insufficient in itself. 1. With an artificial heart and schema of bifurcating elastic tubes there may be obtained, in the entire absence of the aortic valves, not only a considerable dicrotic wave, but a series of succeeding waves, although all are smaller than if the valves were present. 2. These waves occur to some extent even without any cessation of the heart's contraction, and, therefore, without any retrograde movement of fluid at all. 3. If a tracing be taken from the schema close to the valves, the secondary waves are much less marked than they are at a distance. The same thing has been shown from experiments on animals in tracings representing the pressure in the aorta close to the heart, for the dicrotic wave, though visible there, is but little marked. So far as it depends on the cause-already mentioned, it would, of course, be greatest near its origin at the valves.

In the paper before referred to, I have endeavoured to show that the effect of the inertia of the arterial walls would be to set up an oscillation of expansion and contraction in the largest arteries, which would contribute to the formation of the dicrotic wave. The mode in which I suppose this inertia to come into play may be illustrated by taking for comparison a familiar object, namely, a door which is kept closed by an elastic band. If such a door be pushed very slowly open, its pressure

against the hand will be greatest when it is most widely open, and will gradually diminish as it is allowed to close. If, however, it be pushed open quickly its acquired velocity will make it tend to leave the hand, and so diminish the pressure against it, and then as it recoils it will again come more firmly against the hand, and cause a second increase of pressure and a check to its rate of closing, or even an actual second opening. This effect is greater the greater the weight of the door in proportion to the elastic force, and would not occur at all if it were devoid of inertia. Similarly the effect of the inertia of the aorta will be that its contraction takes place with a spring-like recoil, which causes a second increase of fluid pressure, and this again produces a check to contraction or even a second expansion, which is one component of the dicrotic wave. Thus, so far as the dicrotic wave depends on this cause, it begins to occur in the aorta itself, but since the effect at any point is due to all the length of tube up to that point, it will be comparatively small in the aorta, and greater in the peripheral arteries, which is found in point of fact to be the case. The case of the aorta is, of course, very much more complex than that of the door, for the motion at any one point is closely dependent on that at every other point, and nothing can occur analogous to the pushing of the door quite away from the hand.

Thus the first cause of the dicrotic wave depends directly upon the inertia of the fluid, the second cause on that of the arterial walls in the first place, and only secondarily on the inertia of the fluid, because the motion of the tube and of the contained fluid must take place as a whole. The second cause simply tends to make the first arterial contraction greater than it otherwise would be, and to lead to its being followed by a second expansion. It will not, therefore, in general, give rise to a separate wave, but only enhance the dicrotic wave arising from the first cause. There can be no doubt on mechanical grounds that such an oscillation must theoretically take place; the only question could be whether it actually contributes to the dicrotic wave, or is too small to be noticed. If the motion at each point of the tube took place independently, the oscillation could be but small, because water is almost unyielding, but, as it is, yielding is allowed by the elasticity of the envelope in other parts.

The mechanism of these oscillations has some analogy to

what occurs when a stone is thrown into water. The first large wave which spreads in a circle around is followed by other smaller waves in a descending series. These are due, not to any reflection, but to the oscillation of the particles near the seat of disturbance. In experiments with an artificial heart and elastic tubes a similar descending series of waves is always obtained when the interval between the contractions is long enough, and it is not very uncommon, in a pulse which is very compressible but somewhat slow, to see, at an interval after the dicrotic wave not very much less than that between the primary and dicrotic, a repetition of the dicrotic, which I should propose to call the tricotic wave. It is shown in Pl. I, figs. 2, 5, 26, and Pl. II, fig. 13. The slight wave, however, which often follows the dicrotic at only a short interval is due, like the tidal, to acquired velocity in the sphygmograph, and may be called the dicrotic-tidal wave (*cide* Pl. I, figs. 32, 34, 35, 37, and Pl. II, fig. 10).

I have introduced one tracing (Pl. I, fig. 29) to show that a pulse may sometimes be dicrotic, notwithstanding free aortic regurgitation. It was taken from a case of aortic and mitral disease, in which the pulse had generally the characteristic splashing quality, and sphygmographically had an appearance very opposite to that of the present tracing. For a short time, however, while the heart's action was very rapid and ineffective, it took the dicrotic form depicted. In at least one other case besides this I have noticed that, in a pulse of aortic regurgitation, dicrotism could be detected by the finger. It has been said by some that in such a case a double beat can indeed be felt, but that the two beats so felt are the percussion and tidal waves. In both these cases, however, the tidal wave was absent in the sphygmographic tracing, and the second beat that was felt followed the first at an interval corresponding to the dicrotic and not to the tidal wave. I do not believe that the primary and tidal are ever felt as two distinct waves, but I think that in some cases the finger may discern as separate phenomena two things which correspond in some degree to the primary and tidal wave in the tracing, namely, the first impulse of the artery against the finger, and afterwards its full expansion with blood.

In one or two patients in the last stage of mitral disease, in

whom the tricuspid valve had yielded, and a great backstroke in the veins of the neck occurred at each pulsation, I have observed that such backstroke was followed by a dicrotic wave in the veins which could easily be both seen and felt. This phenomenon could not be explained either by the common theory of the dicrotic wave or by that of Dr. Sanderson.

In order to be able to draw any mechanical inferences from the shape of the pulse curve, the most important point to determine is the cause of the variation of dicrotism. Since the recent conversion of an able writer on the subject, all observers are now fortunately agreed that dicrotism is increased by diminution of tension, and that thus, when it occurs in fever, it denotes a relaxation of the small arteries allowing a ready outflow of blood. Some, however, have supposed that it implies also a stagnation of blood in the veins. This could only be a direct cause if the dicrotic wave were due to a reflection from the periphery, which experiment disproves; and reason and observation combine in showing that the condition of the veins comes into play only in so far as it reacts upon the tension of the arteries. Any source of obstruction in the heart or lungs which causes increased fulness and elevated pressure in one part of the circle, namely, in the veins, must at the same time cause diminished fulness and lowered pressure in that part of the circle which is in front of the obstruction, namely, in the arteries. Such a kind of heart or lung disease increases dicrotism (*vide* Pl. I, figs. 26, 27, 30); but in the dicrotism of fever there is no sign of any venous stagnation, and the evidence points rather to diminished tension and increased rapidity of flow throughout the whole vascular system. So far as dicrotism depends on the state of the tubes in which it occurs, it is increased by an increase, not, in the strict mathematical sense of the word, of their elasticity, but of their distensibility. Thus, in the pulse of atheroma, combined with the increase of the tidal, there is a diminution of the dicrotic wave (*vide* Pl. I, fig. 4).

Observation shows that the dicrotism of fever and inflammation cannot be explained as being proportioned solely to the diminution of tension, for although, as a general rule, the most dicrotic pulses are the most compressible, yet there are some dicrotic pulses which will bear a pressure even greater than normal, and, again, there are some very compressible pulses

which are not very dicrotic. Some other element must, therefore, be sought in the causation of dicrotism, and I have endeavoured to show that this is to be found in the short and sudden action of the heart. Such a mode of action is in great measure merely the sequence of the less resistance it experiences owing to the lowered arterial tension and the freedom of outflow; but the want of constancy in the relation of dicrotism to lowered tension appears to show that it depends partly upon nervous influence affecting the heart directly. An instance is given in Pl. II, fig. 2, to show how a hyperdicrotic pulse like that of fever may be produced artificially without any elevation of temperature. It was obtained from a man aged 23, twenty minutes after a dose of four minims of nitrite of amyl, administered internally. The state of his pulse just before taking the drug is shown in Pl. II, fig. 1. The pulse thus obtained is somewhat intermediate in character between that of sthenic and that of asthenic fever, but approximates rather more nearly to the former. Judging by what is known of the physiological effects of nitrite of amyl, we may assume that the result was due mainly to the relaxation of the arteries, with probably, in addition, some degree of stimulation to the force of the heart's contractions. Notwithstanding the marked effect upon the pulse, the patient had himself perceived no effect whatever from the medicine.

Thus there are three things which tend to increase dicrotism, namely, diminution of tension, a jerky action of the heart, and distensibility of the arteries. It is probable that the dicrotism of fever may be in some degree promoted by a change in the last due to muscular relaxation, for although the dicrotic wave must be mainly produced in the largest arteries, in which the muscular element is small, yet the whole length of the artery takes part in some measure in the oscillation which is concerned in its production. Yet the presence of fever is not necessary for the production of great dicrotism, for I have never met with a dicrotic wave so large in proportion as in the pulse shown in Pl. I, fig. 26, which was obtained from a case of close constriction of the mitral valve. In that instance there was no fever, and the effect was due solely to lowered arterial tension, combined with the short sudden contractions of a dilated heart.

The state of things, then, which calls forth the greatest

dicrotism is a very low minimum tension in the arteries, which, at the moment of the heart's contraction, is suddenly, but briefly, raised to a maximum considerably exceeding that minimum, although generally in itself but small (*vide* Pl. I, figs. 3, 26, 29, and Pl. II, fig. 5). If the tension remain low, and the heart's action continue short, but become more feeble, the trace falls suddenly and deeply to the principal (or aortic) notch, but the dicrotic wave is of small absolute magnitude, although the pulse may be hyperdicrotic. Such a diminution of dicrotism often occurs in fevers after it has previously been considerable, and is then a sign of failing power. A pulse of this kind is very readily extinguished by pressure, and it is characterised by a loss of sharpness both of the top of the primary wave and of the bottom of the principal notch (*vide* Pl. II, figs. 6, 7, 9). If the rapidity of the pulse be at the same time increased, such a curve approaches to one of the forms which has been described as monocrotic, and which may occur in a very severe stage of fevers, such as typhus or typhoid (*vide* Pl. II, fig. 9). There is another form of pulse also called monocrotic, which is developed out of the ordinary hyperdicrotic pulse simply by increased rapidity, the dicrotic wave being lost upon the succeeding upstroke. This differs from the former by not indicating the same feebleness of heart's action, and hence it is not necessarily of the same bad prognosis, unless the points of the curve are at the same time rounded. I have never seen this state fully reached in the pulse of fever; but Pl. II, figs. 5 and 11, show a close approximation to it. The former was taken from a case of typhoid, very severe, but ending in recovery; the latter from a fatal case of typhus.

The kind of dicrotism produced by simply lowered tension, accompanied by such an alteration only in the heart's action as would follow secondarily from this, is perhaps best seen in a pulse taken immediately after an extensive loss of blood. Pl I, fig. 28, is a tracing obtained soon after a hæmorrhage from the lung to the extent of fifty-one ounces. It shows slight hyperdicrotism, a slanting primary upstroke, and considerable rounding of points, and it was very easily extinguished by pressure. A dicrotism much greater than this is often found a day or two after hæmorrhage, but this occurs when some degree of fever is superadded, as after wounds or surgical operations.

Pl. II, fig. 5, may suitably be compared with the tracing last mentioned, to show how that suddenness of the heart's action which exists in fever, when combined with a low tension, produces a dicrotism much greater than that which results from the latter alone, while at the same time the points of the curve are sharper. The tracing in question was taken after profuse hæmorrhage in a case of typhoid fever, and Pl. II, fig. 4, shows what the state of the pulse was, previous to the loss of blood. It will be seen that the amplitude was greater after the hæmorrhage than before; and since the diminution of tension by itself would tend to diminish amplitude by making the artery smaller, it would seem to follow that the effect of hæmorrhage was to cause a relaxation of the arteries even greater than that previously existing as a consequence of the fever.

One of the most important points as to the import of dicrotism is the question whether its increase is proportional to the elevation of temperature. The earlier writers on the sphygmograph considered that a close relation existed between the two. Thus it is stated by Wolff, that such a proportion is found, modified only by two circumstances, first, that a greater dicrotism belongs to chronic than to acute diseases at the same temperature; and secondly, that the pulse curve of old age, or that of aortic regurgitation, which he considers to be identical with it, goes through the same changes in fever as the healthy pulse, but at a slower rate, so that its dicrotism is less than that of the latter at the same temperature. Later observers, however, have found that the proportion between the increase of dicrotism and the elevation of temperature varies much in different diseases. I am inclined, however, to think that some have paid less attention than it deserves to the law of Wolff above quoted, in reference to the tardy appearance of dicrotism in senile pulses. It is to be remembered that, in reference to this quality in the pulse, age is not to be measured by years, but that the vascular changes which generally appear in advanced life may show themselves not unfrequently between the ages of thirty and forty, and even at an earlier period. Thus a non-dicrotic quality in a pulse associated with fever, which may at first sight appear due to a special character in the complaint, may really be the effect of pre-existing vascular degeneration. Hence, to find the pulse not dicrotic in a febrile disease such as pneumonia, in

which dicrotism generally occurs, may be of bad prognosis, especially if the patient be not very young, because it leads to the suspicion that his arterial system may be seriously damaged, and that he may therefore be less able to resist the effects of disease.

Again, the senile pulse curve, as it passes through the changes produced by fever, at a certain stage in its progress, assumes the form of the healthy pulse. Therefore, if a person be known to have very rigid arteries, to obtain from him a normal pulse curve may have the same significance as, in the case of a young person, to find a dicrotic pulse. Hence it is important that in all tracings which are to be used as evidence as to the state of the circulation in different diseases, the age of the patient should be noted, and that the temperature recorded should be taken at the same time as the tracing, or at an interval of not more than a few minutes, in order to avoid the errors which might arise from rapid changes of temperature. It is no doubt true that dicrotism is a quality which is more highly marked in the pulse of specific fevers, such as typhus or typhoid, than in that of other febrile conditions at an equivalent temperature. Yet I think that the difference is apt to be overestimated, from the fact that these fevers occur most commonly in young persons, while of cases of surgical fever or erysipelas a larger proportion are in persons who have reached or already passed middle life, and whose arterial system has no longer the elasticity of youth.

There is one kind of pulse with respect to which the sphygmograph might be expected to afford important evidence. I mean the incompressible bounding pulse of inflammatory fever, whose hardness used to be considered the warrant for bleeding. Of this, however, Dr. Sanderson declares that we have no opportunity of investigating it experimentally, since nowadays it is never met with. With this opinion I so far agree that I have never found a pulse which gave me reason to believe that the arterial tension had been increased by fever, understanding by the term arterial tension the tension in the intervals of the pulse, and not the maximum tension reached at the acme of the wave. It is true that it is not very uncommon to find associated with a high temperature a pulse which gives its greatest upstroke under a high pressure, and which also displays another, and perhaps more trustworthy, indication of high arterial tension,

namely, a considerable tidal wave. But in these cases the high tension is due not to the fever, but generally either to previous changes in the heart and arteries, to some morbid condition of the brain, or to albuminuria existing at the time. Such a pulse is shown in Pl. I, fig. 31. It was obtained not long before death from a fatal case of bronchitis in a man aged 60. In this case the temperature was not extremely high, being only 101.0° F., but the rapidity of the pulse was great, namely, 136 in the minute. The urine contained albumen, and the existence of a granular kidney was suspected, but after death the kidneys were found fairly healthy. The arteries were somewhat thick, but not atheromatous, and the heart was very slightly hypertrophied, weighing twelve ounces and a half. The peculiar state of the pulse in this case seems to have resulted from previous vascular changes of very moderate extent, coupled with the effect of a merely secondary and functional albuminuria in raising the arterial tension.

There is another sense, however, in which I do not agree with the statement of Dr. Sanderson before mentioned, for I think that we do now and then meet with pulses which to the finger have all the described qualities of the full hard pulse of sthenic inflammation, and I believe that the sphygmograph reveals the true state of circulation which then exists. The most typical example I have found of this is shown in Pl. I, fig. 3. That tracing was obtained from a strong ruddy-faced youth from the country, at the commencement of acute suppuration of the knee-joint, from a penetrating wound received two days before, and when his temperature was 104.5° F. The pulse bore a very high pressure, but it gave an even greater amplitude at a lower pressure, whence we must infer a very strong action of the heart, causing a high maximum arterial tension, but not a high minimum tension. The absence of the tidal wave shows the heart's contraction to be short although strong, and thus points to freedom of outflow from the arteries. The extent of diastole indicates a low minimum tension, combined with a sudden action of the heart, and the immense amplitude is partly the effect of the heart's vigour, partly of the dilatation of the radial artery. Thus there existed great relaxation of vessels, allowing a rapid outflow from arteries to veins, and consequently a low minimum arterial tension, but at the

same time a strong, sudden, but short action of the heart, which at each pulsation raised the tension to a high maximum. Both conditions together would contribute to accelerate the circulation in the highest possible degree. Pl. I, fig. 5, shows what the pulse of the same patient became after six days' illness. It had then become very compressible, and had all the qualities of asthenic fever.

Another pulse having similar characters, though not in quite such extreme form, is shown in Pl. I, fig. 7. The case was that of a man who the day previous had received a penetrating wound of the chest from a crowbar. The conditions present were acute inflammatory fever, with pleurisy and collapse of one lung, and the temperature was 104.8° F. The same combination is here indicated of low minimum arterial tension, with very powerful, though brief, contractions of the heart. The case was treated by bleeding to the extent of ten ounces. Fig. 8 shows the pulse immediately after the bleeding; fifteen minutes later some reaction had taken place, and the tracing then obtained is seen in fig. 10. Forty-five minutes after the bleeding the temperature had fallen four degrees, but it rose again to 103° F. before death, which took place the next day. It will be seen that this case forms an exception to the general rule that hæmorrhage increases dicrotism, for the pulse after the bleeding was somewhat less dicrotic than before. This is to be explained on the ground that the loss of blood being very moderate, its beneficial effect in lowering fever and diminishing the suddenness of the heart's action more than counterbalanced the tendency which it would otherwise have had, by diminishing tension, to increase the dicrotism of the pulse.

There are thus two varieties of hard pulse which may be associated with a high temperature, first, the dicrotic pulse, which bears a high pressure, as shown in the last two examples, which I regard as the typical pulse of very acute sthenic fever, apart from any cause leading to resistance in the circulation, and which denotes a ready outflow through dilated arteries, but, at the same time, a strong, sudden action of the heart. The asthenic dicrotic pulse differs from this in the fact that the vessels are still more dilated, but the heart's action less sudden and much less powerful. The second variety is the rapid pulse which is not dicrotic, and generally bears a pretty high pressure.

This, if not the result of previous arterial change, shows that the vessels have not undergone that relaxation which generally accompanies fever. If the amplitude of the pulse be at the same time very small, an actual contraction of the arteries must be inferred. Such a pulse is found especially in peritonitis, and is recognised by the finger as the small hard wiry pulse.

I shall now proceed to notice in succession the kinds of pulse found in several kinds of acute disease and the state of circulation to be inferred from them.

1. Surgical Fever.

It has already been shown that sthenic surgical fever in a young person may produce a very dicrotic pulse, yet its tendency to dicrotism is less than that of typhus or typhoid fever. Thus at moderate temperatures the pulse may remain non-dicrotic, and if there be in addition some impairment of arterial elasticity, or if albuminuria be present, this may be the case even at a very high temperature. Some degree of vascular change may have commenced in a man whose pulse is shown in Pl. I, fig. 9, but no apparent atheromatous condition was found post-mortem. The patient had undergone an operation about the tongue, followed by so much hæmorrhage that a ligature was placed upon the common carotid artery two days before the tracing was taken. This was followed by hemiplegia, and the temperature had risen to 104.7° F. at the time of procuring the tracing. An inspection afterwards showed that cerebral softening had occurred. Thus, in this case, besides the fever, there had been at work another cause which generally tends to dicrotism, namely, the loss of blood. The pulse, however, though very quick, is but little dicrotic, and of small amplitude. It will be shown afterwards that this form of curve, which is like that of peritonitis, is commonly found in the rapid pulse of cerebral disease. It is probable, therefore, that it may have been due, in this case, to the condition of the brain, and, if so, must imply that irritation was transmitted to the vaso-motor nerves, unless it be held that, as in the case of the heart, so in that of the arterial system, a paralysis of cerebro-spinal centres may produce the same effect as irritation of the sympathetic.

When surgical fever becomes more chronic the pulse soon

becomes compressible, and assumes the asthenic dirotic form. An example of this is shown in Pl. I, fig. 5, and also in Pl. I, fig. 2. The latter was obtained from a girl aged 21, on whom the operation of excision of the knee-joint had been performed six days before on account of chronic disease. The pressure is low, the dirotic wave large in proportion, the points of the curve somewhat rounded, and the tricrotic wave is also seen, as it is also in fig. 5. In Pl. I, fig. 6, is shown a pulse which approximates more nearly to the asthenic than to the sthenic type, although it was taken quite at the commencement of acute suppuration of the bursa patellæ in a man previously healthy, whose temperature at the time was 104.6° F.

2. Erysipelas.

The pulse in erysipelas has much resemblance to that in surgical fever. When an acute case occurs in a young person, the kind of pulse found at an early stage is generally the sthenic form of dirotic pulse, which bears a somewhat high pressure and has considerable amplitude. An example of this is the tracing shown in Pl. I, fig. 11, which was obtained on the second day of acute medical erysipelas of the face, when the temperature was 104.5° F. Sometimes, even in young persons, the curve is more allied to the non-dirotic form of hard pulse, as in the case shown in Pl. I, fig. 12, in which the presence of the tidal wave and a dirotism which is scarcely full, shows that comparatively little vascular relaxation could have occurred, although the temperature was 105.5° F. Such cases are peculiarly suited for treatment by aconite and other remedies of the same nature.

The pulse of sthenic surgical erysipelas is of a similar character to that of medical, but if it assumes an adynamic quality the pulse becomes compressible, and takes the asthenic dirotic form, with rounded points to the curve, and a greater dirotism in proportion to the temperature. As is the case with surgical fever, if erysipelas occur in a person not very young, in whom vascular changes may have commenced, the pulse often shows no increase of dirotism at all, and may retain evidence of high minimum tension in the presence of a considerable tidal wave. In Pl. I, fig. 13, is shown a tracing obtained on the fourth day

of a case of erysipelas of the face in a man aged 56, whose arteries felt rigid, and whose temperature at the time was 103° F. In fig. 14 is shown the pulse of the same patient twelve hours later, during which time he had taken twenty-five minims of tincture of aconite. The pulse has become more dicrotic, and presents all the signs of diminished arterial tension. At the same time the patient was sweating profusely, his delirium had subsided, and his temperature had fallen to 99·8° F. It is thus evident that although the considerable arterial tension which in this case was at first associated with high fever, might be partly the result of degenerated vessels, it yet must have been partly due to the nature of the disease, since the character of the pulse was so rapidly changed by the action of the remedy, for what could be effected by drugs might also have been effected by the fever.

In Pl. I, fig. 15, is shown the pulse of a woman aged 29, in whom there was no reason to suspect any arterial degeneration. In this the presence of the tidal wave, the high tension, and the absence of any increased dicrotism, combined with the small amplitude, appear to denote a general contraction of arteries, and, therefore, a condition exactly the opposite to that relaxation which generally exists in fever. The case was one of surgical erysipelas, after an operation about the vulva, and it was accompanied by extreme pain. It appeared possible that the effect of this upon the nervous system might be to produce a state of vessels similar to that which exists at the initial stage of fever, when rigors occur, and often in inflammations of serous membranes, in both of which cases the pulse is non-dicrotic. It is to be noted, however, that in this case the temperature was not very high, being only 101·5° F.

3. Acute Rheumatism.

In this complaint I have found dicrotism to be less than in any other acute febrile disease. This appears to be partly because the range of temperature is not in general excessively high, and partly because it shares with surgical fever and erysipelas the peculiarity of having less tendency to produce dicrotism than is found in most zymotic fevers. Thus, in the milder degrees of fever, a fairly-developed tidal wave may indi-

cate that the tension is high and that there is no vascular relaxation. Yet it is not uncommon to find a nearly full dicrotism, especially in feeble persons or in the later stage of the complaint, if the fever continues high. When the hand is affected on the side where the tracing is taken the amplitude is very large, and the dicrotism is generally somewhat greater, while the pulse still bears a rather high pressure. Thus the pulse changes somewhat from the sthenic non-dicrotic towards what I have called the sthenic dicrotic type, in consequence of the local inflammation and the active flux which accompanies it. This confirms the view that such a form of pulse denotes increased freedom of outflow, but an undiminished or enhanced vigour of heart's action. The increased amplitude depends on dilatation of the radial artery, and the increased dicrotism is probably due also to vascular dilatation in the affected limb, since the whole length of artery between the heart and the point where the tracing is taken has some share in the production of the dicrotic wave, and dicrotism increases with an increase in the distensibility of the tube in which it is produced.

The common form of pulse in acute rheumatism is shown in Pl. I, fig. 16. The tracing in fig. 17, taken from a case in which the temperature was lower than in the preceding, shows how greatly the tendency to dicrotism is increased by the complication of mitral regurgitation, on account of the influence which that has in diminishing the arterial tension. I have more than once had my attention attracted by a change of this sort in the pulse to the commencement of endocarditis, when it came on during the course of the disease.

4. Peritonitis.

The pulse of peritonitis has been often described, and its sphygmographic characters agree with those discovered by the finger. It is of small amplitude, rapid, and non-dicrotic, or but little dicrotic, even when the temperature rises to a high point (Pl. I, figs. 18, 21). Thus the state of circulation indicated is exactly the opposite to that which generally occurs in fever, except as to the rapidity of the pulse. The radial artery is contracted, and there is no freedom of outflow, from which it is to be inferred that the small arteries are contracted

also. The heart, however, is not stimulated by this to strong slow contractions as under normal circumstances it would be, but runs on with short feeble beats. The same kind of pulse, although not in so marked a degree, may be found in acute pleurisy, and in pericarditis, and it also occurs in colic, in the cold stage of ague, and during the rigors which usher in a febrile attack. It would seem that there must be one state of the nervous system common to all these conditions, namely, irritation of the vaso-motor nerves; and the fact that this is more greatly developed in peritonitis than in any of the rest may be accounted for on the ground that the sympathetic nerves are involved over a very wide surface in that disease. Irritation of the sympathetic may also account for the fact that the rapidity of the heart's action departs so widely from the relation by which, as shown by M. Marey, it is generally connected with the vascular tension, an occurrence which must indicate that its innervation is profoundly affected.

The pulse of peritonitis generally bears a pretty good pressure, but it may become at length compressible while still remaining non-dicrotic. In that case the absence of dicrotism must be due to the feebleness of heart action rather than to high arterial tension. A dicrotic pulse may sometimes occur when peritonitis exists, if other conditions are superadded. An example of this is shown in Pl. I, fig. 19, a tracing obtained from a woman aged 31, on whom the operation of ovariectomy had been performed five days before. In that case there was suppuration about the wound, and the patient was in a very low state, for the tracing was obtained only a few hours before death.

The tracing in Pl. I, fig. 22, was obtained from a woman aged 26, who, twenty-five days after the operation of ovariectomy was attacked by severe vomiting, and other symptoms somewhat resembling peritonitis. The pulse is most unlike that of peritonitis, the pressure borne is a very low one, and both dicrotic and tricrotic waves are well marked. In this case an inspection revealed that there was hardly any peritonitis, but a rapid diffusion of malignant growth.

5. Pericarditis.

When slight pericarditis occurs in the course of acute rheumatism, no characteristic alteration recurs in the pulse; if, however, it be more considerable, there is generally an increase in the rapidity of the pulse without any corresponding increase of dicrotism. In those cases, however, in which severe pericarditis produces a marked effect on the pulse, the typical form of curve that results is not unlike that of peritonitis, except that it is not always of such small amplitude, for it is rapid without being dicrotic (*vide* Pl. I, fig. 23). In some cases the heart may be thrown into extreme perturbation, as shown in Pl. I, fig. 24. That tracing was obtained from a case of pericarditis set up by pyæmic abscess of the heart. The larger elevations seen are due to the respiratory curve, the smaller notches are the pulsations, which were at the rate of about 360 per minute.

There are cases in which the pulse of even severe pericarditis shows considerable dicrotism, as in Pl. I, fig. 25. In that case, as so often happens, when convalescence had commenced and the pericardial sounds had disappeared, an endocardial bruit became audible. It appeared probable, therefore, that the dicrotic quality of the pulse might have been due to the commencement of mitral regurgitation, which did not until some time afterwards manifest itself by a bruit.

6. Pneumonia.

In its effect on the pulse pneumonia occupies a somewhat intermediate position between the three diseases first noticed, namely, sthenic surgical fever, erysipelas, and acute rheumatism, on the one side, and the zymotic fevers, as typhus and typhoid, on the other. As a rule the pulse in pneumonia is dicrotic, and I have not met with exceptions to this rule under the age of twenty-five. Sometimes even a considerable degree of hyperdicrotism is reached (*vide* Pl. II, fig. 15), but yet the dicrotism is not quite so great in proportion to the temperature, at any rate in the milder degrees of fever, as it is in typhoid. The pulse also differs from that of typhoid in two other respects—

first, that it bears a higher pressure, at least in the earlier stages of the complaint; and, secondly, that the points of the curve are sharper, and the upstroke more nearly vertical. Hence of the two causes of dicrotism, namely, lowered tension and suddenness of heart action, the latter plays comparatively a greater part in pneumonia than it does in typhoid, and the pulse approximates somewhat more nearly to the sthenic dicrotic type. When, however, the pneumonia occurs secondarily in the course of phthisis, the pulse may take at once the asthenic dicrotic form (*vide* Pl. II, fig. 18). If in pneumonia occurring in a person who has reached middle age the pulse be found non-dicrotic, while at the same time the temperature is high, and other signs of severity exist, the absence of dicrotism must be considered rather an unfavorable sign, because it then indicates, not that the fever is mild, but that the arterial system has undergone degeneration, or else it is associated with the presence of albuminuria. An instance of this is shown in Pl. II, fig. 17. It was obtained from a case of pneumonia in a man aged 54, in which albuminuria was present, and which eventually proved fatal, and was taken when the temperature was 102.2° F. Secondary albuminuria, however, in pneumonia or in typhoid fever may often coexist with a dicrotic pulse, for although it appears to have a tendency to increase arterial tension, due either to the state of the kidney, or to the state of blood antecedent to the albuminuria, yet this may be counterbalanced by the other conditions present.

7. Typhus and Typhoid Fever.

It is in the case of these fevers that the indications of the sphygmograph relatively to prognosis have been already most fully and most usefully treated by previous writers. I shall here only speak of them in reference to the conclusions which must be drawn in respect to the state of the circulation which exists in them. At the outset of typhoid fever in strong persons the pulse, while quickly becoming dicrotic, may for a time bear a moderately high pressure, and thus have something of the quality of the sthenic dicrotic type. Soon, however, and it may be from the commencement, it becomes very compressible, although at quite a low pressure the amplitude may be consider-

able. The upstroke also grows somewhat slanting, and both the summits and the bottom of the principal notch become rounded, so that when the fever is severe the line of the tracing presents an undulatory appearance (*vide* Pl. II, figs. 7, 8). Typhus fever differs from typhoid only in the fact that the pulse more rapidly assumes the asthenic quality, and shows it in a higher degree (*vide* Pl. II, fig. 11). Everything combines to show that in this case the principal element in the causation of the dicrotism is the extreme lowness of the arterial tension; and we must infer that in these fevers more than in any other disease a relaxation of the vessels takes place, which allows a ready outflow from the arteries into the veins. The heart, however, is acting with much less suddenness and power than in the more sthenic forms of fever, and it appears probable that the actual rapidity of the circulation is much less than that which may be attained in such cases when the heart is vigorous and the vessels at the same time moderately relaxed.

In two cases at the commencement of typhoid I have found a pulse-curve of a shape which I have not seen noticed by any writer on the subject; it is shown in Pl. II, fig. 3. The pressure is not very low, the primary summit is rather pointed, and the trace falls deeply from that point to the principal notch, which is sharp and is followed by two secondary waves. From this must be inferred an arterial tension not quite so low as commonly happens in typhoid, and a contraction of the heart, which is sharp at the commencement, but shorter than is usual, even in fever. The result is that the trace rises to a summit more above the level of the true pulse-wave than is generally the case in dicrotic pulses. From this point it falls rapidly, but does not catch the still more rapidly falling true wave until the bottom of the principal notch is reached, from which it rises to a wave preceding the dicrotic wave, and in this case due solely to a recoil in the sphygmograph. Therefore, although corresponding to the tidal wave, it no longer indicates the passage of the arterial tide, and it might, therefore, be called the pseudo-tidal wave. The resulting curve thus looks like a pulse in which the dicrotic wave has become reduplicated. A curve somewhat similar is occasionally found in one form of the rapid pulse of cerebral disease. The cases of typhoid in which I observed such a pulse-curve ran afterwards a very severe course,

and were accompanied by much delirium. This form of curve, however, only lasted for a day or two, and was then replaced by the ordinary dicrotic pulse. Somewhat similar forms of curve, obtained in cases of cerebral disturbance, are shown in Pl. I, fig. 20, and in Pl. II, fig. 27. Another case, in which the dicrotic wave is also sometimes broken into two by the effect of recoil in the sphygmograph, is when fever supervenes in a person whose heart has previously become hypertrophied, and makes his pulse dicrotic. The hypertrophied heart then appears to adopt a mode of contraction somewhat resembling that which, in the other case, is the result of nerve irritation.

A form of pulse which is very important in its bearing on the question of what is the true physiological condition in fever is that which sometimes occurs in typhus or typhoid, and is fully developed only when the disease is approaching a fatal termination (*vide* Pl. II, fig. 9). The primary summit becomes broadly rounded, and may even approach to a square shape, while, at the same time, the dicrotic wave becomes smaller in proportion, though the principal notch is even more rounded than before. Dr. Anstie has specially noticed the very unfavorable prognosis to be derived from a pulse like this, and he explains it as denoting a contracted state of the small arteries. If this be so, then we must suppose that, in this most severe stage of fever, there supervenes a state of vessels precisely the opposite of that which is characteristic of fever in general, and especially of these particular fevers. Dr. Anstie has not recorded the pressures at which his tracings were taken, but I have generally found that when the pulse underwent this ominous change it became even more compressible than before. I should, therefore, explain it as indicating a more feeble and sluggish, though quickly repeated action of the heart, which fails to call out any considerable dicrotic wave, although the arterial tension remains as low as before. I consider, therefore, that the state of circulation in typhus or typhoid differs from that which exists in most other forms of fever in the fact that, while the vascular tension is still lower than in them, the heart's action is more feeble and sluggish, and that it is simply the exaggeration of the latter quality which tends to the development of this kind of monocrotism.

It is evident that the same sluggishness of recoil which, when tension is high, can only be due to a long vigorous action of the

heart, the consequence of obstructed outflow or impaired arterial elasticity, may, when tension is very low, result from the extreme feebleness of the distending force. Thus, the feeble pulse of mitral disease (Pl. I, fig. 30) shows a roundness of summits very like that of the undulatory pulse of fever (Pl. II, fig. 8). It is true that the diminution of the dicrotic wave does not occur when the dilated heart of mitral disease is beginning to fail. It may, indeed, be somewhat difficult to tell whether such a pulse is absolutely monocrotic, or whether every second elevation is the dicrotic wave, but I believe that the latter is the true explanation (Pl. I, fig. 30). The different state of things in the pulse of fever may be explained partly on the ground that in that case the rapidity is greater in proportion to the magnitude of each beat. Thus, in the almost monocrotic pulse of fever, a late dicrotic wave is partly cut off by the succeeding upstroke. On the other hand, if the mitral pulse becomes very rapid it becomes also very small, and thus the dicrotic wave, following more closely, finds room for itself before the next upstroke, as in Plate I, fig. 30. Another reason, probably, is that the action of a dilated heart has a peculiar shortness, which is specially adapted for calling out the dicrotic wave (*vide* Pl. I, fig. 26). I have, however, met with a few cases in which the sphygmograph appeared to give evidence of such an obstructed circulation as that described by Dr. Anstie. One of these is shown in Pl. II, fig. 12, which was obtained from a fatal case of typhus in which the pulse had before shown the ordinary dicrotic character. The pressure is somewhat greater than it had been previously. The primary wave is very broad, and not only is the dicrotic wave little marked, but there is no deep fall preceding it. The arterial tension must, therefore, have become somewhat elevated in the later stage of the fever at the same time that the heart became sluggish. In the cases of this kind which I have observed the urine has been albuminous, and the effect is probably to be attributed to a state of blood either the result of the condition of the kidneys or itself a consequence of the fever, and antecedent in point of causation to the albuminuria. But the effect of the fever-poison in itself, by its action, as it would seem, on the nerve centres, must be to cause vascular relaxation, and not contraction, since there is evidence that in these fevers such relaxation occurs in a greater proportion

than usual to the elevation of temperature. Thus, in this rare case of obstructed circulation in fever, we are driven for explanation to the same alternative as in the case of that obstruction which is the rule in Bright's disease even when acute,—either that the altered blood is delayed in its circulation by a modification of capillary forces, or that it causes a contraction of the arterioles by means of reflex irritation conveyed through the peripheral nerves. Of these two explanations the former would avoid the necessity of supposing that the same poison is capable of producing, through the nervous system, two opposite effects.

There is a form of febrile complaint, not uncommon, in which a person is attacked suddenly by feelings of severe malaise, and the temperature rises rapidly to a high point, such as 103° or 104° F. Such an indication of the thermometer is apt to cause an impression that some severe disease must be commencing, and even to raise a suspicion that the complaint may be typhus fever. In a few days, however, it all passes off, and the attack has to be reckoned as being nothing more than febricula. It is a malady which is very commonly observed in hospital nurses. In one or two cases of this kind I have found that, notwithstanding the high temperature, the pulse-curve had a shape very different from that of typhus, and, indeed, not deviating widely from the standard of health. One of these is shown in Pl. II, fig. 14. Further experience, however, would be required to show whether the sphygmograph can be used in such cases as affording a more reliable aid to diagnosis than the thermometer.

8. *Cerebral Disease.*

Among the obvious qualities of the pulse in cerebral disease the chief thing to be noted is that the most opposite varieties may be found in different cases—in one a very slow pulse and in another a very rapid one, and that it is often impossible to determine the precise reason of the difference. Moreover, the rhythm may be irregular, and in this way the pulse may change from one type to another within very short intervals. The sphygmograph, while confirming these facts, adds another of a similar character, namely, that the rapid form of cerebral pulse may in different cases present curves of quite opposite character, sometimes dicrotic and sometimes the reverse, sometimes of high

tension and sometimes of low. These different forms of pulse must, no doubt, severally correspond to particular states of the nerve centres, but what those states are there seem to be at present no means of ascertaining.

There is one form, however, which presents considerable constancy of character, and that is the slow variety of cerebral pulse, such as often occurs from compression of the brain, or as a consequence of a blow upon the head; such a pulse is shown in Pl. II, fig. 19 and fig. 20. The pressure is considerably higher than normal, and the curve sustained. The primary wave is well marked, but its upstroke often somewhat slanting, as if in consequence of the high tension. The tidal wave is large and expanded, denoting a prolonged flow of blood. Now the slowness of the heart's action must by itself tend to lower the arterial tension, since the quantity of blood pumped into the arteries is thereby rendered smaller. Therefore the increased tension in the slow cerebral pulse shows that the slowness of the heart's action is more than counterbalanced in its effect upon the arterial tension by a contraction of the arterioles, which diminishes the freedom of outflow. It may be concluded that the mode of action of the heart is, in the main, secondary to the increase of arterial pressure, and that the slow cerebral pulse is therefore not due to direct nervous influence acting on the heart so much as to an excessive action of the vaso-motor nerves throughout the body from irritation communicated to them.

This form of pulse may be usefully compared with the slow pulse produced in a healthy person by the application of external cold (*vide* Pl. II, fig. 21), the effect of which will be generally allowed to be a contraction of all the vessels. The curve in this case differs only from the former one in the fact that the amplitude is less, and the several waves less distinctly separated, owing to the "percussion element" being smaller. Both these circumstances point to less vigour in the heart's contraction. In the cerebral pulse shown in Pl. II, fig. 19, the curve appears to show an irritable suddenness in the commencement of the contraction, and its form approximates somewhat to that of Bright's disease occurring in a young person. But in a more severe form of cerebral affection, when coma becomes deep, the heart's action loses its suddenness and force, and the pulse-curve first takes a form like that of the pulse produced by cold (Pl. II,

fig. 21), and afterwards becomes of yet smaller amplitude, though still sustained and bearing a somewhat high pressure.

The rapid cerebral pulse is, as a rule, not dicrotic, and requires for its development a pretty high pressure, and it thus affords an instance in which the rapidity of the pulse is not secondary to the lowering of arterial tension, but must depend upon nervous influence acting directly upon the heart. This is the usual form of curve when the pulse becomes rapid in coma, as shown in Pl. II, fig. 23 and fig. 26. In the latter case there was but little dicrotism, although the temperature had reached so high a point as 105.7° F. The case was one in which coma and death followed a series of epileptiform fits repeated at short intervals. There was no albuminuria, and no lesion of brain was found post-mortem. The pulse has a small amplitude like that of peritonitis and its tension is not very low; whence it must be inferred that, notwithstanding the very high temperature, there was an excessive action of the vaso-motor nerves, producing a general arterial contraction.

If the rapid cerebral pulse becomes dicrotic, it belongs, as a rule, to the sthenic dicrotic type; the points of the curve are sharp, the pressure not very low, and the dicrotism not very great in proportion to the temperature. Two instances of this are shown in Pl. II, fig. 30 and fig. 31. The first was obtained from a woman aged 30, who was attacked by tubercular meningitis during the course of phthisis. This tracing was taken when she had become comatose, and it will be seen that full dicrotism had just been reached at a temperature of 103.2° F. In the earlier stages of the cerebral disease the dicrotism was scarcely more than normal, and the pulse presented a contrast to its previous condition, which resembled that which often occurs in phthisis when the temperature is elevated, namely, one approximating to the asthenic, undulatory dicrotic type. The second case was one of extensive sclerosis of the brain and spinal cord in a woman aged 23. After the disease had long been running a very chronic course the temperature suddenly began to rise rapidly, the patient became comatose, with lividity of face and oppressed breathing, and died in a very few hours. The tracing shown in Pl. II, fig. 31, was taken about two hours before death.

Another form of rapid cerebral pulse is that shown in Pl. I,

fig. 20, which was obtained from a case of fatal cerebral rheumatism in a woman aged 40, after profound coma had commenced, and the temperature had risen to 106.2° F. The dicrotism is not excessively great, thus denoting that vascular relaxation had not progressed at the usual rate in proportion to the increase of temperature. The form of curve somewhat resembles the unusual form found at the outset of typhoid (*vide* Pl. II, fig. 3), and, as in that case, indicates an irritably sudden and short heart's action, with a vascular tension not very low.

In all these cases the arterial relaxation was either entirely absent, or its degree was less than usual, in proportion to the increase of temperature. In Pl. II, fig. 24, however, is shown a pulse in which the dicrotic wave has a very large proportionate magnitude, and the pressure is very low, while the elevation of temperature is only moderate (101.6° F.). The case was one of traumatic meningitis, secondary to comminuted fracture of the skull, and exposure of the brain substance. Soon after the accident, and four days previously to the time at which this tracing was taken, the pulse had shown, in a marked degree, the very opposite state of circulation, namely, a much greater elevation of temperature (103.5° F.), with but little, if any, vascular relaxation, and apparently an actual increase of arterial tension (*vide* Pl. II, fig. 22). The dicrotism is but little more than normal, the tidal wave still appears, and the pressure is as high as five ounces. It is evident that the arterial pressure may be actually increased, notwithstanding some degree of vascular relaxation, if at the same time the heart is acting more rapidly than usual, and not ineffectively, and this may have been the case in the pulse in question.

There is one cerebral condition in which there is commonly a rapid pulse without any increase at all of temperature, and that is in acute mania. It will be readily understood that in this case, when excitement is great, the obtaining a tracing is a process of no little difficulty, and one which may involve great peril to the sphygmograph, while in the more chronic forms of mania the pulse often presents nothing of interest. In the case of mania the variability in the degree of dicrotism, which is associated with the same rapidity of pulse, is still more marked than in other forms of cerebral disease. The pulse, which at one time is hyperdicrotic, may in the same person at another

time show a normally shaped curve, while still remaining as rapid as before; and sometimes, while the sphygmograph remains fixed upon the arm, a change in the degree of dicrotism may be seen in accordance with the rapidly changing emotions. In Pl. II, fig. 32, is shown one case in which the pulse was hyperdicrotic. In this instance, therefore, the state of circulation generally accompanying fever, and of which the most important element is vascular relaxation, is found to coexist with a normal temperature. It has already been shown that the same state of things may be produced by the administration of nitrite of amyl. In the present case, however, the points of the curve are sharper, and the dicrotic wave shows a tendency to be broken into two by the effect of recoil in the sphygmograph, thus indicating more of irritable suddenness in the heart's action. From this fact, that a febrile pulse may coexist with a normal temperature, it may be inferred that the excess of heat in fever is not the effect of the increased supply of blood to the tissues, nor in any other way the result of the state of the vascular system which generally accompanies it. But the association of the two is so general, whatever be the origin of the febrile state, that there must be some link of causation between them, and it may therefore be concluded that elevation of temperature tends to cause vascular relaxation, although this effect may be modified or even quite counteracted by other conditions.

A very dicrotic pulse, however, is the exception in mania, and a more common form is that shown in Pl. II, fig. 29, a tracing obtained on a different occasion from the same patient. In this curve the tidal wave appears, and while the amplitude is small the pressure required is unusually great. Thus, on this occasion there was an abnormal contraction instead of abnormal relaxation of the vessels. Another specimen of the pulse of mania is shown in Pl. II, fig. 25. Although a rapid pulse obtained from a girl of 20, its shape resembles that of the slow pulse of old age, for the tidal wave forms a convexity following close upon the primary summit, while the pressure is greater than normal. This form of curve, if not the effect of arterial degeneration, which would seem unlikely in so young a person, must indicate that, while the outflow from the arteries is obstructed, and the arterial tension high, each

contraction of the heart is prolonged, although the beats are quickly repeated. This pulse must be contrasted with that of peritonitis and other similar conditions (*vide* Pl. I, fig. 18), in which there exists the same vascular contraction and consequent increase of arterial tension, but the heart's action, while becoming rapid, becomes also short, so that the tidal wave is not increased, but generally diminished or lost. Thus in this case of mania the effect on the arteries was similar to that produced by irritation of the sympathetic system, but that on the heart was different.

In Pl. II, fig. 28, is shown a tracing obtained from a case of subacute mania in a woman aged 25, whose pulse was not very rapid. It differs from a normal pulse in that the pressure is greater and the tidal wave more prolonged; the amplitude is also rather small. Hence in this case also there was arterial contraction and prolonged action of the heart.

Thus we see that in cerebral affections, including mania, there are found greater abnormalities than occur in any other diseases as regards the relation which generally subsists between the temperature, the rate of pulse, and the relaxation or contraction of the vessels. As a general rule there is less vascular relaxation than usual in proportion to the increase of temperature. Examples, however, are found of the opposite extremes in both directions; on the one side great vascular relaxation, with a normal temperature, and, on the other side, and more commonly, a very high temperature combined with actual vascular contraction, instead of any relaxation—a state of things which may occur also when there is irritation of the sympathetic, as in the case of peritonitis. We must conclude, therefore, that in diseases of the brain there is generally a transmission of irritation to the vaso-motor nerves, unless it be supposed that, as in the case of the heart, so in that of the arteries, besides the centres of stimulation, there are other centres of inhibitory action, whose locality has yet to be discovered, and that these may become paralysed in some cerebral affections. It is certain that in some cases, such as that of severe concussion, the occurrence of paralysis would seem more probable than that of over-action.

9. *Acute Nephritis.*

The state of the pulse in chronic Bright's disease as displayed by the sphygmograph has been discussed by Dr. Sanderson and several other writers. Its characters are high pressure, generally a large amplitude, a tidal wave which occurs early and is broadly expanded, and a dicrotic wave rather small in proportion (*vide* Pl. I, fig. 33). All these testify to an obstructed outflow, causing high arterial tension and a prolonged vigorous action of the heart.

In many cases of tubal nephritis occurring in persons who have reached middle age I have found that the pulse shows considerable approximation in character to that typical form which belongs especially to a granular kidney. In such cases, however, it is very difficult to be quite certain that an insidious chronic change had not preceded the acute attack; but that Bright's disease in itself does exert a marked influence on the pulse is shown by the effect of acute nephritis in young persons, for in such cases a most characteristic form of tracing is often found. Such a pulse-curve in its most pronounced shape occurs in no other condition, and recently, out of five consecutive cases of acute nephritis of from three weeks' to three months' standing, in patients under the age of twenty-five, I have found it typically shown in every one. There are some cases, however, in which it is absent, just as in some of granular kidney the characteristic form of pulse is sought for in vain.

Four of the tracings referred to are shown in Pl. I, fig. 32, fig. 34, fig. 35, and fig. 37. The pressure is somewhat above normal, but the excess is not so great as in cases of granular kidney in old persons, and the amplitude of the trace is generally rather less than usual. The tidal wave is strongly marked, as in the case of Bright's disease in an older person, but its shape is different. Instead of being broadly rounded it has a rather pointed summit, which may rise nearly as high as the primary wave, and it is preceded by a somewhat deep notch. So different in its aspect that, on first seeing such a trace, one would be apt to consider that it could not be the same wave as the tidal wave of the form shown in Pl. I, fig. 4 or fig. 33, but their identity is established by the fact that all intermediate steps between the

two shapes may be found. This peculiarity of shape shows that the tidal wave does not in this case simply coincide with the corresponding part of the true pulse-wave, and so denote only the prolongation of the arterial tide, but that it is partly due to the element of recoil, which is brought into play by the fact that, the primary summit having risen considerably above the true wave, the first notch dips in its turn below it. A second oscillation of the same kind adds somewhat to the height of the dirotic wave, and third, and perhaps even a fourth, may follow that wave.

The actual features, then, which are seen in these peculiar curves are due in part to an oscillation set up in the sphygmograph, but the pulse must have some very peculiar quality to produce this effect, since it occurs under no other circumstances; and no doubt its peculiarity is made much more manifest in this way than if the actual form of the true wave could be quite literally transcribed. The quality to which the result is due must be an extreme suddenness in the commencement of the wave, which, however, is, at the same time, well sustained, as is proved by the development of the tidal wave; for if the heart's action were jerky, and not, at the same time, prolonged, the trace would fall suddenly without any tidal wave, and form a dirotic curve, as it may do when fever is superadded to Bright's disease (*vide* Pl. I, fig. 36). Thus, in acute nephritis as well as in chronic, there is commonly an obstructed outflow from the arteries and consequent elevation of tension. The small amplitude of the trace might at first sight lead to the conclusion that the theory of Dr. Johnson, that the small arteries are spasmodically contracted in Bright's disease, is true, and that such contraction occurs not only in minute vessels, but in arteries of the size of the radial. It is open, however, to another explanation, for if the arterial tension be raised and the heart's contraction be thereby protracted, the pulse-wave, while becoming longer, will be diminished in height, and the amplitude of the trace will therefore be less. It will be seen that in one tracing, obtained from a patient in whom the disease had lasted three months, the amplitude is considerable, as if some hypertrophy of the heart had already taken place. It is evident that arterial contraction alone would not account for the whole effect, for in that case the curve would be the same as that produced

by cold (*vide* Pl. II, fig. 21), or by the use of ergot, but it is very different.

In several cases in which symptoms of uræmia had appeared in young persons without any elevation of temperature, I have found the amplitude still smaller, and the pressure required to develop the pulse extremely high, namely, from six to ten ounces. In these cases, therefore, with the appearance of the uræmic symptoms, the signs of obstruction to the circulation became greatly enhanced, and it might be suggested that some, at least, of the cerebral symptoms in cases of the kind are due to the deficient blood supply which would result from such obstruction. But, on the other hand, it is possible that there may be an arterial contraction which is itself secondary to the state of the brain produced by uræmia, since it has been shown that such contraction frequently accompanies cerebral disturbance.

In cases of Bright's disease in young persons, in which inspection afterwards shows the kidney to be small and granular, the form of pulse-curve closely resembles that which was found in these instances of acute nephritis, including even the smallness of amplitude. This I have found to hold true in the case of two patients under the age of twenty, in whom such a kidney was found, and whose hearts were hypertrophied, weighing as much as seventeen ounces. In them, therefore, the increase of vascular tension, if not an actual contraction of the radial artery, must have more than counterbalanced the effect of the heart hypertrophy as tending to increase the amplitude of the pulse.

The evidence of the sphygmograph, therefore, is that in albuminuria there is generally an obstructed outflow and consequently elevated arterial tension, whether this be due to arterial contraction or to a physiological impediment to the circulation of the blood through the minute vessels, which results from a change in its relations to the tissues, and a consequent modification of capillary forces. But if an acute inflammation arise in the course of Bright's disease, and the temperature be thereby considerably raised, the pulse may become ~~diminished~~ *diminished* or, in other words, the effect of fever in relaxing the vessels and thereby lowering tension overcomes the ~~effect of the Bright's disease to increase tension by causing~~ *effect of the Bright's disease to increase tension by causing* the circulation to be ~~reduced~~ *reduced*. The heart, however, still retains

some of its vigorous suddenness of action, so that the points of the curve are sharp, the dicrotism not very great in proportion to the temperature, and the dicrotic wave often shows a tendency to be broken into two from the effect of recoil. This character is all the more marked if the Bright's disease be chronic, and the heart, therefore, have previously become hypertrophied. Two instances of a dicrotic pulse in Bright's disease are shown in Pl. I, fig. 36, and Pl. II, fig. 27. The first was obtained from a case of pleurisy and purulent pericarditis in a girl aged 18, who had previously been one month ill with acute nephritis. The temperature at the time was 105° F. The second was taken from a case of granular kidney in a man aged 73, who had fallen into a typhoid condition from uræmia and whose temperature had risen to 101·5° F.

The foregoing brief review of the state of the pulse in various acute diseases may throw some light upon the important law laid down by Professor Marey, as regulating the rapidity of the heart's action, namely, that increased rapidity is due to lowering, and diminished rapidity to elevation of the arterial tension. Amongst other evidence in support of this he has adduced experiments on the hearts of turtles, detached from the body, but still beating, and adapted to artificial tubes, the pressure in which can be raised or lowered at pleasure. There can be no doubt that it is proved that, other things being equal, such a relation between the arterial tension and the rate of the pulse holds good, and that variations of tension produce in this way a most important effect in the body. But Professor Marey maintains that this relation holds good almost universally, although he himself allows that one or two exceptional cases occur, such as that of peritonitis. Thus he explains the variation of the rate of pulse in different positions of the body as due solely to changes thereby produced in the fluid pressure at the level of the heart as regulated by the force of gravity. Again, he considers that the increased rapidity of the heart, which results from muscular exercise, is purely the consequence of a diminution of arterial tension caused by a relaxation of the arterioles, which allows a more ready outflow under such circumstances.

I think that a comparison of the various tracings which I have attempted to explain will tend to show that the variation

of tension is only one of the causes regulating the heart's rapidity, although it is the one most constantly in action, and that in very many cases other influences come also into play. Thus, in several other conditions besides peritonitis, pulses have been shown which are non-dicrotic and bear a high pressure, and must, therefore, indicate high arterial tension, but which, at the same time, are very rapid (*vide* Pl. I, figs. 13, 15, 31; Pl. II, figs. 22, 23, 25, 26, 29). Again, there are other pulses which are dicrotic and very compressible, but which are, nevertheless, slow enough to allow the tricrotic wave also to appear (Pl. I, figs. 2, 5, 22, 26); and it has been shown that, in the case of fever, the evidences of arterial relaxation and lowered pressure are not in uniform proportion to the increase of temperature or the rapidity of the pulse, but that, in this respect, different diseases have peculiarities of their own.

It is true that after violent exercise the pulse-curve does become more dicrotic than before, and, therefore, Professor Marey is no doubt right in supposing that the arterioles in such a case become relaxed. The increase of dicrotism, however, is not generally very great, and the tidal wave is usually still seen—an indication that the arterial tension has not fallen very low. Moreover, I have generally found in such cases that the pulse gave a higher primary upstroke under a higher pressure than it did previously to the exercise, whereas the contrary would have been the case—so far, at least, as regards the pressure—if the only change in the heart's action had been an increase of rapidity due to lowering of arterial tension. Hence the heart must have been stimulated by nervous influence to contract with greater force, and it is, therefore, probable that its increased rapidity is not solely secondary in such cases to arterial relaxation, but that it depends partly upon similar nervous influence.

The effect on the pulse of mental excitement, of alcohol, and of ether, resembles that produced by muscular exercise. In the case, however, of alcohol, and still more in that of ether, the increased vigour of the primary upstroke may be more marked. Thus the pulse which is produced by ether presents a strong contrast to the dicrotic pulse, which results from the use of nitrate of amyl, the effect of which is much greater in relaxing the vessels, but much less in stimulating the heart. The

increase of rapidity, however, may be similar in the two cases, and thus we have here another instance of corresponding increments of rapidity associated with very different states of the vascular system. Again, the pulse-curves give evidence that nervous influence may affect, not only the rapidity of the heart, but its mode of contraction ; for this appears to be the only means of explaining why the curves of Bright's disease in young persons should differ from those of other high tension pulses (compare Pl. I, figs. 32, 34, 35, 37, with Pl. II, figs. 19, 20, 21) ; or, again, of accounting for the unusual forms of dicrotic pulse shown in Pl. I, fig. 20, and Pl. II, fig. 3. The conclusion, therefore, is that while the law stated by Professor Marey holds good so long as other conditions remain equal, yet its author has attributed to it a somewhat too universal scope, in seeking to explain by its means almost every variation in the rate of pulse.

EXPLANATION OF THE PLATES

Illustrating Dr. Galabin's Paper on the State of the Circulation in Acute Diseases.

The tracings have been copied by photo-lithography. They have been reduced in size from the originals in the proportion of three to two, as the sphygmograph with which they were taken is one whose clockwork movement is rapid, and which gives a rather greater amplitude than usual to the tracing.

PLATE I.

Fig. 1. Pulse of a healthy person, which shows the secondary waves with unusual distinctness. Pressure 3 oz.; pulse 60. The amplitude is somewhat greater than usual; the tidal wave rather more marked. The dicrotic wave is very distinct. After it is seen a slight convexity in the curve, which is probably the tricrotic wave. The condition indicated is that of somewhat relaxed vessels and a strongly acting heart. It is a kind of pulse common in those accustomed to muscular exercise.

Fig. 2. Pressure 2 oz.; temp. 100·5°; pulse 114. From a woman æt. 21, on whom the operation of excision of the knee-joint had been performed six days before on account of chronic disease. There is slight hyperdicrotism; the points of the curve are rounded, and the tricrotic wave is seen following the dicrotic.

Fig. 3. Pressure $4\frac{1}{2}$ oz.; temp. 104.5° ; pulse 115. From a man *æt.* 22, at the commencement of suppuration of the knee-joint from a penetrating wound received two days before.

Fig. 4. Pressure 4 oz.; pulse 58. From a man *æt.* 70, whose arteries were very rigid. The tidal wave is here greatly developed. A similar form of curve is often found in chronic Bright's disease, but in that case the pressure employed may be much greater. In both cases a prolonged contraction of the heart, in consequence of increased resistance, is indicated.

Fig. 5. Pressure 1 oz.; temp. 102.6° ; pulse 98. From the same person whose pulse is shown in fig. 3, after an interval of six days. The pressure has now become very low, the amplitude small, the points of the curve rounded, and the tricrotic wave is distinctly seen.

Fig. 6. Pressure 2 oz.; temp. 104.6° ; pulse 120. From a man *æt.* 21, on the first day of inflammatory fever, from suppuration of the bursa patellæ. The lower pressure and the more rounded points of the curve indicate a much less sthenic form of fever in this case than in that shown in fig. 3.

Fig. 7. Pressure 4 oz.; temp. 104.8° ; pulse 144. From a man *æt.* 30, who the day before had received a penetrating wound of the chest from a crow-bar.

Fig. 8. Pressure 4 oz. Pulse of the same man fifteen minutes later, taken immediately after the abstraction of 10 oz. of blood.

Fig. 9. Pressure 3 oz.; temp. 104.7° ; pulse 132. From a man *æt.* 44, in whose case a ligature had been placed upon the common carotid on account of hæmorrhage following an operation on the tongue.

Fig. 10. Pressure 4 oz. From the same patient as fig. 7 and fig. 8. The present tracing was taken fifteen minutes after that in fig. 8. Some reaction had then taken place; the pulse had increased in amplitude, and again become more dicrotic.

Fig. 11. Pressure 4 oz.; temp. 104.5° ; pulse 102. From a boy *æt.* 19, on the second day of erysipelas of the face.

Fig. 12. Pressure 4 oz.; temp. 105.5° ; pulse 115. From a woman *æt.* 23, on the third day of erysipelas of the face. Full dicrotism has barely been reached in this case. The small wave which precedes the dicrotic corresponds to the tidal wave, but occurring in this position it does not indicate the arterial tide, and may, therefore, be better called the pseudo-tidal wave. Its presence denotes a very strong and sudden action of the heart, combined with a minimum arterial tension not so low as in ordinary dicrotic pulses.

Fig. 13. Pressure $4\frac{1}{2}$ oz.; temp. 103.0° ; pulse 125. From a man *æt.* 56, and having rigid arteries, on the fourth day of erysipelas of the face.

Fig. 14. Pressure 2 oz.; temp. 99.8° ; pulse 96. From the same patient, after an interval of twelve hours, during which time he had taken twenty-five minims of tincture of acónite. He was sweating profusely when this tracing was taken.

Fig. 15. Pressure $4\frac{1}{2}$ oz.; temp. 101.5° ; pulse 114. From a woman *æt.* 29, on the second day of erysipelas, following an operation upon the vulva. She was in great pain when the tracing was taken.

Fig. 16. Pressure $3\frac{1}{2}$ oz.; temp. 101.6° ; pulse 90. From a case of acute rheumatism in a woman *æt.* 23.

Fig. 17. Pressure 2 oz.; temp. 100·5°; pulse 104°. From a case of acute rheumatism, combined with mitral regurgitation, in a girl, *æt.* 16.

Fig. 18. Pressure 3½ oz.; temp. 102·7°; pulse 125°. From a case of peritonitis in a woman, *æt.* 28, who had undergone the operation of ovariectomy three weeks before. The patient died a few days after the tracing was taken.

Fig. 19. Pressure ¼ oz.; temp. 104°; pulse 156. From a woman, *æt.* 31, who had undergone the operation of ovariectomy five days before. The tracing was taken a few hours before death. Suppuration had occurred about the wound, and the patient was much exhausted. Evidence of peritonitis was found post mortem.

Fig. 20. Pressure 3 oz.; temp. 106·2°; pulse 104. From a case of cerebral rheumatism in a woman, *æt.* 40. She became comatose about eight hours after the temperature had begun to rise to an unusually high point, and the tracing was taken while she was in that condition. The first of the two secondary waves is the pseudo-tidal wave, which is seen also in Pl. II, fig. 3. An unusually short jerky action of the heart is indicated by its appearance.

Fig. 21. Pressure 2½ oz.; temp. 104°; pulse 120. From a case of tubercular peritonitis in a woman, *æt.* 35.

Fig. 22. Pressure 1 oz.; temp. 99·6°; pulse 120. From a woman, *æt.* 26, who had undergone the operation of ovariectomy twenty-five days before. Post mortem, it was found that there was scarcely any peritonitis, but a rapid diffusion of malignant growth.

Fig. 23. Pressure 3 oz.; temp. 101·5°; pulse 110. From a case of pericarditis, with acute rheumatism, in a girl, *æt.* 18.

Fig. 24. Pressure ½ oz.; temp. 103·2°; pulse 360; resp. 65. From a case of pericarditis set up by pyæmic abscess of the heart in a girl, *æt.* 12. The larger elevations seen are due to the respiratory curve; the small notches are the pulsations.

Fig. 25. Pressure 2 oz.; temp. 102°; pulse 125. From a case of acute rheumatism and severe pericarditis, with effusion, in a girl, *æt.* 14. A fortnight later a systolic bruit at the apex became audible.

Fig. 26. Pressure 1 oz.; temp. 98·8°; pulse 120. From a case of close constriction of the mitral valve in a boy, *æt.* 20. The dicrotic wave is nearly as high as the primary, and the tricrotic wave is seen, although almost lost upon the succeeding upstroke.

Fig. 27. Pressure 1½ oz.; temp. 99·1°; pulse 88. From a case of bronchitis in a man, *æt.* 42.

Fig. 28. Pressure 1 oz.; temp. 98·4°; pulse 120. From a man, *æt.* 35, about two hours after hæmorrhage from the lungs to the extent of 51 oz.

Fig. 29. Pressure 1 oz.; temp. 99·6°; pulse 165. From a case of free aortic regurgitation, combined with mitral disease, in a man, *æt.* 22. His pulse had generally very little dicrotism, but for a short time, while the heart's action was very feeble and rapid, it became highly dicrotic.

Fig. 30. Pressure 1 oz.; temp. 98·6°; pulse 140. From a case of mitral regurgitation in a woman, *æt.* 20.

Fig. 31. Pressure 5 oz.; temp. 101°; pulse 136. From a case of bronchitis with albuminuria in a man, *æt.* 60. Post mortem, the kidneys were found pretty

healthy. The diminution of the tidal wave and descent of the base line, seen in the first pulsation, occurred with each inspiration.

Fig. 82. Pressure $4\frac{1}{2}$ oz.; pulse 60. From a case of tubal nephritis of three months' standing in a boy, *æt.* 19.

Fig. 83. Pressure 7 oz.; pulse 94. From a case of chronic Bright's disease, in a man, *æt.* 50.

Fig. 84. Pressure 5 oz.; pulse 54. From a case of acute nephritis, of three weeks' duration, in a woman, *æt.* 25.

Fig. 85. Pressure 4 oz.; pulse 76. From a case of acute nephritis, of four weeks' duration, in a woman, *æt.* 23.

Fig. 86. Pressure 4 oz.; temp. 105° ; pulse 110. From a girl, *æt.* 18, who was attacked by pleurisy and fatal purulent pericarditis, after an illness of nearly four weeks with acute nephritis.

Fig. 87. Pressure $4\frac{1}{2}$ oz.; pulse 75. From a case of acute nephritis of about three weeks' duration in a man, *æt.* 21. In all the pulses of acute nephritis two slight waves are seen following the dirotic wave. The first of these is formed like the tidal wave, and may be called the dirotic tidal wave. The second of the two is either the trirotic wave or a repetition of the last.

PLATE II.

Fig. 1. Pressure $3\frac{1}{2}$ oz.; pulse 72. The usual pulse of a man, *æt.* 23, whose pulse is also shown in fig. 2.

Fig. 2. Pressure 2 oz.; temp. 98.2° ; pulse 96. The pulse of the same man after a dose of four minims of nitrite of amyl given internally.

Fig. 3. Pressure $2\frac{1}{2}$ oz.; temp. 102.8° ; pulse 110. A very unusual form of pulse, obtained at the commencement of typhoid in a boy, *æt.* 18, whose urine at the time was albuminous.

Fig. 4. Pressure $1\frac{1}{2}$ oz.; temp. 102.5° ; pulse 102. The pulse of the same patient sixteen days later.

Fig. 5. Pressure 1 oz.; temp. 102.5° ; pulse 150. From the same patient after two days more, and soon after the occurrence of profuse hæmorrhage, from which, however, he recovered.

Fig. 6. Pressure 1 oz.; temp. 103.4° ; pulse 120. Pulse obtained on the thirteenth day of a very severe case of typhoid in a boy, *æt.* 13.

Fig. 7. Pressure 1 oz.; temp. 103.5° ; pulse 120. Pulse obtained on the sixth day of typhoid in a girl, *æt.* 14.

Fig. 8. Pressure 1 oz.; temp. 103.2° ; pulse 124. Pulse of a case of typhoid in a girl *æt.* 12. The tracing has some resemblance to the feeble undulatory pulse of severe mitral disease shown in Pl. I, fig. 30.

Fig. 9. Pressure $\frac{1}{2}$ oz.; temp. 103.5° ; pulse 125. From the same patient as fig. 8 at the most severe stage of the disease. Dirotism is here diminished much less than the heaving of the heart although the pulse has become even more undulatory than before.

Fig. 10. Pressure 1 oz.; temp. 101.9° ; pulse 135. Unusual form of pulse, obtained from a boy, *æt.* 14, convalescent from typhoid. Primary and dirotic waves are both very sharp and both tidal and dirotic tidal waves are also seen.

Fig. 11. Pressure 1 oz.; temp. 104.6° ; pulse 170. From a fatal case of typhus in a man, *set.* 26.

Fig. 12. Pressure 2 oz.; temp. 103.7° ; pulse 105. Non-dicrotic form assumed by the pulse at the later stage of a fatal case of typhus in a man, *set.* 53, whose pulse had previously been dicrotic. His urine was albuminous at the time.

Fig. 13. Pressure 2 oz.; temp. 98.1° ; pulse 72. The pulse of a boy, *set.* 14, convalescent from typhoid. The triacrotic wave is seen, as well as the dicrotic; the tidal is absent.

Fig. 14. Pressure 3 oz.; temp. 103.2° ; pulse 104. From a woman, *set.* 39, on the second day of a febrile attack, which lasted only three or four days. The presence of the tidal wave and the moderate degree of dicrotism show that there is no relaxation of arteries nor lowering of tension.

Fig. 15. Pressure $1\frac{1}{2}$ oz.; temp. 103.5° ; pulse 160. From a fatal case of pneumonia in a man, *set.* 24, whose urine was at the time albuminous.

Fig. 16. Pressure 2 oz.; temp. 102.6° ; pulse 144. From a case of pneumonia in a man, *set.* 39.

Fig. 17. Pressure $3\frac{1}{2}$ oz.; temp. 102.2° ; pulse 110. From a fatal case of pneumonia in a man, *set.* 54, whose urine was albuminous.

Fig. 18. Pressure 1 oz.; temp. 100.6° ; pulse 96. From a case of phthisis, with pneumonia, in a man, *set.* 35.

Fig. 19. Pressure $5\frac{1}{2}$ oz.; pulse 43. From a case of fractured base of the skull in a man, *set.* 54.

Fig. 20. Pressure 5 oz.; temp. 98.8° ; pulse 58. From a case of abscess of the brain in a man, *set.* 34.

Fig. 21. Pressure $4\frac{1}{2}$ oz.; temp. 97.5° ; pulse 52. Pulse showing the effect of external cold on a healthy man, *set.* 26.

Fig. 22. Pressure 5 oz.; temp. 103.5° ; pulse 105. From a case of comminuted fracture of the skull, exposing the brain, in a man, *set.* 21.

Fig. 23. Pressure 4 oz.; temp. 99.2° ; pulse 130. From a man, *set.* 38, who in the last stage of hepatic ascites fell into profound coma, during which this tracing was taken. No lesion was found post mortem, except an extremely cirrhotic liver.

Fig. 24. Pressure 2 oz.; temp. 101.6° ; pulse 120. From the same case as fig. 22, taken four days later. The patient at the time had continuous convulsive movements on one side.

Fig. 25. Pressure 5 oz.; pulse 114. From a case of acute mania in a girl, *set.* 20.

Fig. 26. Pressure 3 oz.; temp. 105.7° ; pulse 150. Pulse of a girl, *set.* 11, taken during fatal coma, which succeeded to a series of epileptiform fits. No lesion was found post mortem.

Fig. 27. Pressure $2\frac{1}{2}$ oz.; temp. 101.6° ; pulse 110. From a case of uræmia from chronic Bright's disease in a man, *set.* 73.

Fig. 28. Pressure $4\frac{1}{2}$ oz.; pulse 60. From a case of subacute mania in a woman, *set.* 25.

Fig. 29. Pressure $4\frac{1}{2}$ oz.; pulse 110. From a case of subacute mania in a woman, *set.* 50.

Fig. 30. Pressure $2\frac{1}{2}$ oz.; temp. 103.2° ; pulse 145. The pulse of a woman,

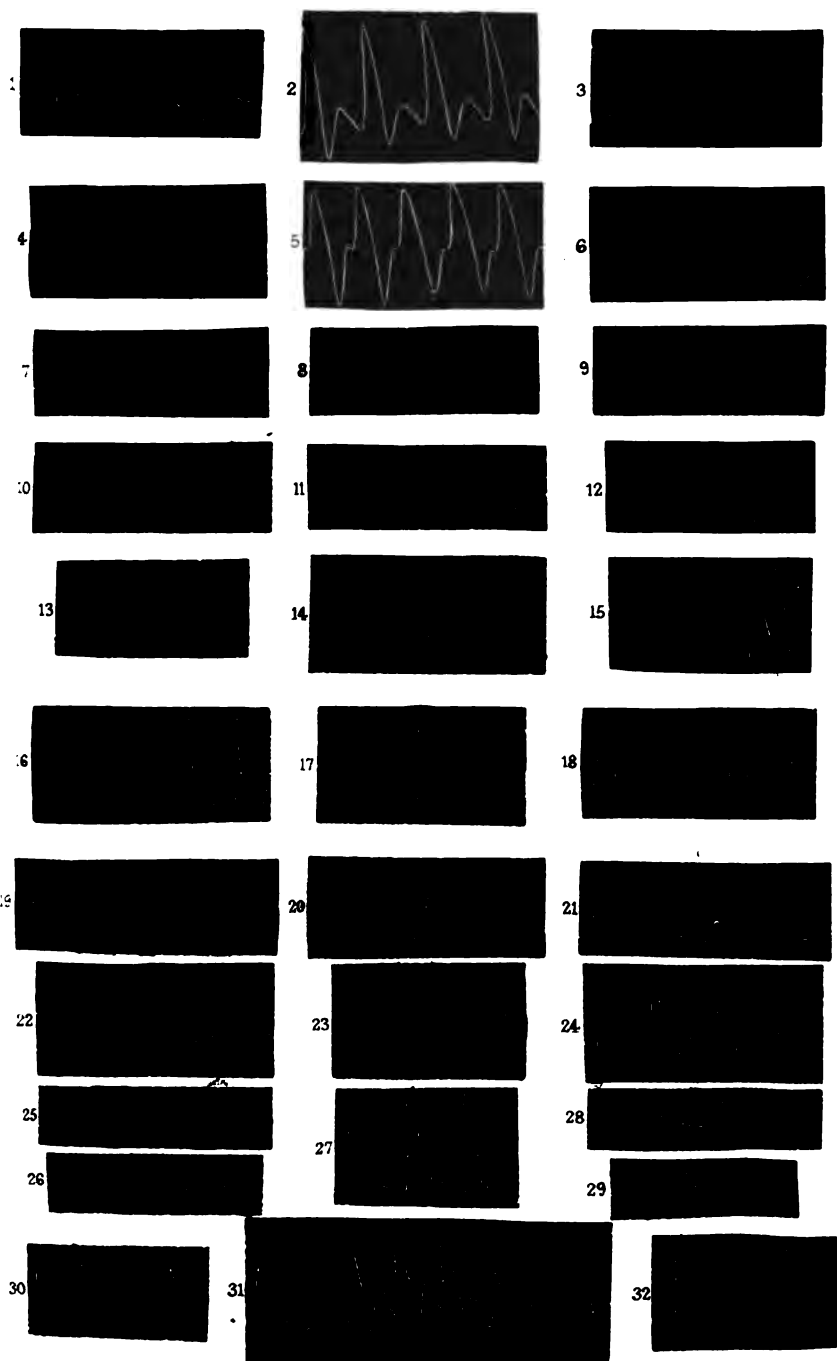
100 *Explanation of Dr. Galabin's Plates—continued.*

æt. 30, taken when she was in a comatose condition from tubercular meningitis, which came on in the course of phthisis.

Fig. 31. Pressure 2 oz.; temp. 105.3° ; pulse 144. From a case of extensive sclerosis of the brain and spinal cord in a woman, æt. 23. The tracing was taken about two hours before death, after she had suddenly become comatose. The respiratory curve is marked, and one or two beats are much enfeebled by the effect of a gasp at the end of inspiration.

Fig. 32. Pressure $2\frac{1}{2}$ oz.; pulse 120. Taken from the same person as fig. 29, on a different occasion.

PLATE II.



REPORT ON OPERATIVE SURGERY.

(WITH ILLUSTRATIONS.)

By THOMAS BRYANT.

PART I.

IN this, the first, I trust, of a series of select reports on operative surgery, I propose to quote from the records of the hospital some of the most interesting cases that have been under my care within its wards, and, to increase their interest and value, I shall append to each case, or group of cases, such clinical or pathological remarks as may suggest themselves. I hope, moreover, to be able to illustrate these papers by drawings.

In the following report some examples of tumours connected with bone will claim attention, more particularly those of the face and jaws, an instructive series of these cases having recently fallen into my hands for treatment.

In the succeeding reports the subjects will be determined by the circumstances of the year, exceptionally interesting cases being recorded as they occur, and groups of cases being made when by so doing interest or instruction can be added to their record. In this way I hope to be able to impart to the readers of these volumes some of the lessons that are to be learnt within the walls of Guy's Hospital, and to fulfil, in a measure, the trust that was imposed upon me when I became a member of the staff of the institution, and a clinical teacher in its school.

CASE 1.—*Osseous Tumour or Enostosis of Frontal Sinus and Orbit; Removal of Tumour; Recovery.*

(Reported by Mr. D. T. EVANS.)

Albert K—, an ostler, æt. 24, was admitted into Job Ward, on the 19th of November, 1873, on the recommendation of Dr. E. Charlton, of Fareham. When admitted, a hard and apparently osseous tumour existed in the centre of the forehead, extending from the root of the nose upwards for about two inches; it had a smooth, rounded outline, and appeared to be covered with a shell of bone, the integument of the forehead over the tumour being quite free. The bony growth spread also into the right orbit, which it partially filled, the frontal tumour and the orbital growth being apparently connected together by means of a neck of bone that stretched across the inner two thirds of the upper margin of the orbit (Pl. I, fig. 1).

The right eyeball was displaced forwards, downwards, and outwards; the conjunctiva over it was much injected, and the tears ran over the face; the lids moved freely over the eyeball, and the patient had perfect command over the muscles of the orbit; the sight of the eye was unimpaired when he looked forwards or downwards, but he had double vision when looking upwards; he could see distant objects distinctly with both eyes, but not with the affected eye alone. There were two small openings discharging pus, one close above the inner angle of the lids, the other at the junction of the middle and inner third of the upper orbital arch.

History of case.—The man stated that the first thing he noticed was the protrusion of his right eye forwards, five years ago, and this protrusion steadily increased for three and a half years; at this date a small lump appeared, on the middle of the forehead, and after this lump appeared, the protrusion of the eye ceased; the frontal swelling was at first the size of a pea, but it increased rapidly.

He had always enjoyed good health, had measles when eight years old, and did not recollect being struck near the eye.

Soon after the eye first commenced to protrude he became an in-patient at the Winchester Infirmary, where iodine was painted over the lower rim of the orbit and the eyelid, and blisters were

applied to the mastoid process of the right side and on the forehead above the right eye. Twelve months later he was admitted a patient at the Moorfields Eye Infirmary, where an opening was made above the inner junction of the eyelids of the right eye, which never closed, and still exists as the present sinus. He did not know whether any matter was let out at the time the opening was made. He remained in both places three weeks, but experienced no benefit from either treatment.

After this he attended to his work for three years without much inconvenience, excepting when he stooped; he then became very giddy, and would almost fall.

On December 3rd an operation for the removal of the growth was undertaken. It was commenced by a horizontal incision, three inches long, above the eyebrow, and the parts covering in the orbital growth were reflected upwards and downwards, care being observed not to touch the eyeball. The growth was found to go back some way into the roof of the orbit, and it was removed with difficulty piece by piece, most of it being detached by means of a chisel. In Pl. I, fig. 2, the orbital mass is represented of the natural size as removed. The orbit having been cleared, the neck of the growth, which extended upwards into the frontal sinus, became visible; accordingly, Mr. Bryant at once extended his incision through the integuments across the bridge of the nose to the left eyebrow, in order to expose the frontal projection, and having done this he cut away with the mallet and chisel the shell of bone which covered in the disease. Having effected this, a large mass of bone of a yellow colour was exposed (Pl. I, fig. 3), the bone resting in a bed covered with granulations, the granulations apparently springing from the inner surface of the frontal sinus. By means of an elevator the bony growth was then raised from its bed and speedily removed, the new growth having been clearly placed between the two layers of bone that form the frontal sinus, and projecting into the orbit.

Very little bleeding attended the operation. The integuments were subsequently brought together and fixed by sutures. The eyelids were carefully closed, and a pad of lint bound over the whole, a scruple of chloral being given at night.

December 4th.—Did not sleep well last night; no sickness. Temp. 98°. Pulse 96.

5th.—Temp. 98·5°.

6th.—Temp. 99°. Pulse 84. Apparently doing well in all respects.

10th.—The cornea of the right eye began to slough, causing a little pain; he had no headache, nor was he sick; the following day the eyelids were very much puffed, and he suffered from deafness in the right ear; his bowels also were constipated, but they were relieved the next day, and the deafness was a little better.

16th.—The patient was blind with his right eye, from the cornea of which there was a slight purulent discharge; he complained of a headache, and of a pain in his right ear; a small quantity of blood came away from the ear the next day, and his headache disappeared.

30th.—The wound over the eyebrow had quite healed; the right eyelids were still inflamed, and there was a copious discharge of pus from beneath them; a small abscess had formed in the middle of the forehead, which was opened and dressed with dry lint.

January 14th.—By Mr. Bader's advice the edges of the eyelids were pared and stitched together; pressure was afterwards applied to the eyeball.

23rd.—The eyelids at their outer part had united, but not at the inner. From wearing the pad the eye had gone back considerably; there still seemed to be a good deal of suppuration.

February 4th.—The patient's deafness returned, but after having the ear syringed out he heard better. The eye was in much the same condition.

March 1st.—His ear was again syringed.

7th.—The wound made by the operation had completely healed, and the forehead had assumed its normal appearance. The patient left the hospital feeling quite well; there was still some discharge from the eye.

Mr. Bryant saw this patient on January 8th, 1874. The appearance of the forehead was natural. There was still one sinus open, leading down to a piece of exposed bone in the orbit. The eyeball had not withered. The man was to come in to have the bone removed.

Report on the specimen by Dr. Goodhart.

No special interest attaches to this particular instance of ivory exostosis, apart from that, belonging to the whole group. As possessing individuality, it may be said that, though it must be called an exostosis eburnea, still it was not of that extreme density which is sometimes found, and yet it was harder than compact bone usually is, or at any rate harder than the compact bone-tissue usually observed in tumours, which, though dense, is often by no means resistant to instrumental interference.

Such growths, as is well known, have a tendency to grow in concentric layers, and also to die in the same way; indeed, if it were not that they so often attack a spot where the space is limited, as the cranium, there seems no reason why advantage should not be taken of this fact in pathology to chance their spontaneous separation. When they have reached a certain size, which may be supposed to depend entirely upon the amount of nutriment to be obtained through their peduncle or point of attachment to the bone contained beneath, the circumferential layers die. When dead, it may reasonably be inferred that they carry with them the train of troubles—or advantages in this instance—which dead parts always do, that is to say, they excite a reactive cell-growth in surrounding parts. This latter state cannot continue in bone, and least of all in compact or ivory bone, without blocking up the blood-channels and depriving it of some of its already too small supply of blood. So does the whole mass die. The earlier stages of this process were beautifully seen in this particular case.

The microscopical features of this and all such tumours may be summed up very shortly by describing them as structureless bone. They have bone-corpuscles with, perhaps, not a very good arrangement of canaliculi, but still not very abnormal in their appearance. They have large irregular spaces, which may be called Haversian canals, but the two systems, Haversian and canalicular, have no definite relation to each other; they are placed anyhow (Pl. VII, figs. 2, 3, 4).

Remarks.—The case just recorded is an interesting example of a very rare affection, and of one which at present is not thoroughly understood. It was clearly a case of osseous tumour

of the frontal sinus, projecting into the orbit, the growth apparently having sprung from the mucous or periosteal membrane of the frontal sinus, and expanded the cavity; it had no neck or direct attachment to the bones in which it was imbedded, as in the more ordinary exostosis or bony tumour.

Such tumours are found only in the frontal sinus or in the nasal fossæ; they grow, when left alone, to a great size, and give rise to much disfigurement, the amount of pain attending their growth being determined by the nerve-pressure they cause, and the direction of their expansion.

In the case quoted the disfigurement was great, but the pain was little, as no sensitive nerve of importance was involved.

These tumours, moreover, from the investigations of M. Olivier,¹ appear to run a definite course, and, having lived their time, die; they may then slough out, after causing the destruction of the parts by which they are encapsuled. In Mr. Hilton's well-known case this result took place ('Guy's Rep.,' Series 1, vol. i), and the patient lived.

In the case recorded the osseous growth had apparently reached the limit of its life, for when exposed in the frontal sinus the mass of bone presented a yellow, bloodless surface, and was surrounded by granulations. In the process of time it might, indeed, have died, and been cast off, but before this end could have been effected the shell of bone which covered in the mass must previously have been destroyed, and a large amount of sloughing taken place, with the necessary expenditure of much time and great risk.

With respect to the diagnosis of this case little can be said. The osseous nature of the tumour was not questioned, although its origin was far from clear; the growth apparently occupied the frontal sinus and expanded it, the surface of the frontal tumour presenting a smooth and rounded outline, with no marginal ridge or inequality; and from these observations it seemed possible that the case might have been one of the osseous tumours of the frontal sinus; from the fact, however, that it encroached far into the orbit, and, indeed, first declared its presence by causing severe protrusion of the eyeball, the greater probability of its being an exostosis was admitted.

Had a more correct diagnosis of the case been made, the form

¹ *Sur les Tumeurs osseuses des Fosses nasales.* Paris, 1869.

of operation undertaken for the removal of the growth would have been somewhat different.

Operation.—The operation which was performed for the removal of the disease was undertaken with the idea that an exostosis probably existed, and with the view more of removing the portion that occupied the orbit than the enucleation of the whole. The line of incision along the eyebrow was, however, so arranged that an extension might be made to allow of the frontal growth being attacked, should circumstances justify the attempt.

When the orbital mass was exposed and chiselled away,—a task, it must be added, of considerable difficulty, on account of the extreme hardness of the growth,—the neck of the orbital half was clearly seen passing upwards and inwards towards the frontal sinus, and this induced me at once to prolong my cutaneous incision across the bridge of the nose, to reflect the integument and expose the whole. This I did by means of the chisel and hammer, the shell of bone covering in the new growth being readily cut away. When the shell of bone was removed and the endosteal osseous tumour exposed, a remarkable appearance presented itself, for the new growth appeared yellow and bloodless, and it was surrounded by a thin bleeding line of granulations, connected with the bone in which the tumour was imbedded.

The nature of the case then became tolerably clear, and it was fully proved as soon as, by the introduction of an elevator beneath one of the borders of the tumour, the whole mass was steadily raised out of its bed and enucleated. This was not, however, done quite as a whole, for some of its projecting out-growths, which had made their way into the left orbital ridge and into the hollows in the frontal bone, had subsequently to be removed, the careful use of the chisel, hammer, and bone forceps, facilitating and completing the operation.

The subsequent progress of the case towards recovery, with one exception, left nothing to be desired, the wound healed kindly, and the hollow in the frontal bone left by the removal of the growth gradually filled up. The subsequent disfigurement was also very slight.

The exception just made to the satisfactory progress of the case had reference to the eyeball, for the reader will have

observed that some sloughing of the cornea, with subsequent blindness, followed the operation. Now, this result, I have little hesitation in admitting, was due to a want of care in keeping the eyelids closed, for although this was done after the operation, and the parts were carefully kept in position by means of a pad and strapping, it would have been better to have fastened the lids together by means of sutures. In spite of the care observed after the operation to keep the lids shut, the upper lip was gradually opened, and the cornea sloughed simply from exposure. From a surgical point of view this error in treatment spoilt an otherwise very satisfactory case, although I may add that the patient was well pleased with the success obtained.

TUMOURS OF THE UPPER JAW.

CASE 2.—Dentigerous Cyst of the Upper Jaw connected with the Right Upper Canine Tooth: Removal of the Tooth; Recovery.

Sarah D—, æt. 12, engaged in service, was admitted into Dorcas Ward on the 24th January, 1872, for some enlargement of the right upper jaw, a swelling existing beneath the right cheek, and in a position corresponding with the middle and outer part of the superior maxillary bone (Pl. II, fig. 1). The patient had a complete set of teeth, except on the right side of the upper jaw, where the canine was missing; the central incisor was slightly displaced towards the right, and the lateral incisor still more so, a gap being left between them; a larger gap existed between the lateral incisor and the first bicuspid. Exactly above this latter gap there was a prominent swelling, which was partly covered by a transparent-looking membrane, which felt tense on pressure with the finger.

It appeared that two years ago she first observed a swelling on her right cheek, and that the right upper canine milk tooth was extracted three weeks afterwards. She saw Mr. Salter at a late period, who cut into the swelling, and he regarded the case as one of dentigerous cyst of the upper jaw.

January 26th, 1872.—An incision was given, and a free incision made to the swelling, beneath the cheek and above the nose. A small portion of the wall of the cyst removed. The parts

were then held aside by retractors, when the missing tooth was seen glistening within the exposed cavity. By means of the forceps the tooth was without difficulty extracted. It was a perfect canine tooth, with a curved fang, and its crown was projecting upwards and inwards from the posterior part of the palate plate of the cyst (Pl. II, fig. 2).

February 1st.—The cheek was swollen and painful, the inflammation having extended up below the eye to the inner canthus.

2nd.—The inflammation had disappeared, and the swelling of cheek was much reduced.

9th.—The cavity in the mouth was filling up. The patient was discharged on the 11th of February, well.

CASE 3.—Fibrous Tumour growing from the Anterior Plate of the Upper Jaw ; Excision ; Recovery.

(Reported by Mr. FURNIVALL.)

Agnes M——, æt. 62, was admitted into Guy's Hospital on February 14th, 1870, under the care of Mr. Bryant, for a tumour of the left upper jaw, which caused great deformity. It had been growing for five months, and first showed itself as a swelling below the orbit. When admitted the tumour appeared to occupy the whole of the anterior and outer surface of the bone, its nasal surface being but slightly involved. The palate plate was free from the disease, at least it retained its natural shape. The tumour had a hard fibrous feel. The eyeball was tilted up, but the sight was good. The teeth were sound.

On February 22nd Mr. Bryant proceeded to remove the growth, having previously given it as his opinion that it was of a simple nature. He said he should only take away the diseased portion, and leave the palate plate, if possible. He first exposed the growth by Fergusson's incision, splitting the upper lip, and turning back the cheek flap by making his incision along the nostril and then along the orbit. By this means the whole tumour was exposed. He then sawed through the nasal and malar processes, and with bone forceps separated the tumour from the alveolar processes, and enucleated it *en masse*. It clearly sprang from the anterior surface of the maxillary bone. A clean cavity was left

with the palate plate, the mouth in no way having been interfered with. There was no bleeding of any consequence.

The parts were then carefully adjusted by sutures. On the third day these were removed, primary union having taken place. The cavity in the mouth healed up kindly, and on March 9th, sixteen days after the operation, she left the hospital cured.

The tumour was of a fibrous nature, and had nothing cancerous in its structure. It was microscopically of the same nature as the case next to be recorded.

CASE 4.—Fibrous Sarcoma, involving the whole of the Alveolar Process of the Upper Jaw ; Operation ; Cure.

Mary A—, æt. 37, the mother of seven children, was admitted April 23rd, 1872, into Guy's Hospital, under Mr. Bryant's care.

When about thirteen years of age (twenty-four years ago) a lump, the size of a pea, appeared on the outside of the gum of the right upper jaw, and when it grew larger she had it removed. It reappeared, and when eighteen years of age she applied blue stone to it, which caused the tumour to slough out, and for three years she believes she was well. At this time, when she was twenty-one, the growth reappeared, and two years later it was excised; since then she has had several operations performed for its removal, but never with any permanent effect. The last operation was three years ago, and at that time it appeared within the teeth.

On admission the whole of the alveolar process of the right upper jaw, from the lateral incisor to the last molar, the palate plate of the superior maxillary bone, and half an inch across the median line, is occupied by an irregular tumour, of a firm fibrous feel, and with deep depressions in it corresponding to the teeth of the lower jaw; but the tumour does not apparently involve the body of the bone.

May 7th.—Mr. Bryant removed the tumour by making an incision through the lip, and reflecting the cheek upwards with the nostril; he then divided the alveolar process in the median line with a saw, and made a horizontal section of the body of the bone into the nose, twisting out the growth with a pair of forceps. Torsion was applied to the vessels, and four sutures were applied.

11th.—Wound united. Sutures removed. Scar hardly to be noticed.

16th.—Is up and about.

When about to leave the hospital, on May 25th, she was attacked with bronchitis, which kept her back. She left, however, convalescent on June 3rd, being told to return to have a plate with teeth adapted by Mr. Salter when the parts should have become quite healed.

Some months subsequently this patient was quite well.

Report by Dr. Goodhart.

The microscopical appearances of this tumour need no detailed description. Suffice it to say that it is an epulis of the purest form of fibrous tissue to be found in the region of the jaws. It will be seen, on referring to Pl. VII, fig. 1, that much of it is a loosely arranged, wavy fibrous tissue, very similar indeed to that of Case 7, while it also has in parts many cellular embryonic elements. According as the latter preponderate or not, so do tumours like this tend towards the sarcoma group, or the purely fibrous, and in this particular instance, the fibrous parts being in excess, it may be called a fibroma. Some further remarks connected with it will be found intercalated with those appended to Case 6.

Remarks.—The three cases just quoted of tumour of the upper jaw are worthy of attention in a clinical as well as in a pathological point of view. In the latter sense they illustrate three different ways in which the upper jaw may become the seat of a tumour, and in the former they point out the means by which these tumours should be treated. In one aspect, however, all these cases were alike; the disease was local, and involved only one portion of the bone; and in the treatment applied, the local disease was alone removed, the jaw-bone in each case being practically saved.

Case 2 is of peculiar interest, for it represents a class of cases that is never found except in young subjects; it occurred in a patient during the period of dentition, and manifested its presence as a gradual painless expansion of the lower portion of the body of the bone, attended by the deficiency of a tooth—the

canine—the enlargement in the bone being caused by its malposition.

Such circumstances as these ought always of themselves to attract the attention of the surgeon, and to suggest the idea that any enlargement of a jaw-bone may be due to a like cause. For it is clinically true that in young subjects such mal-placed teeth are not rarely the cause of a cystic enlargement of one or other of the jaw-bones, generally of the upper, and, I believe, a malplaced tooth is more commonly than supposed the exciting cause of the development of some of the solid tumours of the jaw.

I have certainly met with one case of cancer of the upper jaw in a child which evidently sprang from a molar tooth; the tooth having been found in the centre of the tumour at its base, growing upwards from the palate plate of the upper jaw; and I shall record in a later page (Case 5) a case in which a bony myeloid tumour of the upper jaw appeared to have been produced by a missing canine tooth, the tooth having been found, during the operation for the removal of the growth, below the orbital plate.

I would therefore suggest that upon such facts as these the treatment of all like tumours of the jaw ought to be based. In the case recorded the cystic swelling was cut into beneath the cheek, and a portion of the wall of the cyst excised, when the missing canine tooth became visible, growing upwards from the palate plate of the bone; the tooth was extracted, the cyst in which it grew contracted, and a cure ensued.

In all like or allied cases, in which tumours of the jaw are found in children during the period of their second dentition, more particularly when a tooth is missing, the tumour ought always to be explored and cut into before any more severe measure is entertained, the extirpation of a cystic tumour growing in the jaw of a child, without its previous exploration, in these days of advanced pathological knowledge, being a surgical error which, I trust, no modern surgeon could fall into.

Cases 3 and 4 differ from the one previously quoted, in that they had apparently no connection with dentition. They were, however, local tumours of a benign kind, and required local treatment. In Case 3 the tumour grew from the anterior wall

of the upper jaw, in Case 4 from the alveolar process and palate plate; in both cases the removal of the local disease was sufficient to effect a cure, the bulk of the bone being untouched. In neither of the cases would any more heroic treatment have been justifiable. The cases were treated upon the principle of "the least possible sacrifice of parts," and with success; indeed, it is upon this principle that most of the tumours of the upper jaw ought to be dealt with: what is diseased should be removed when removal is called for, but no healthy tissue ought to be taken away.

CASE 5.—*Myeloid Dentigerous Tumour of Right Upper Maxilla; Exploration; Excision of Portion of Jaw with missing Tooth; Recurrence; second and third Operation; Recovery.*

(Reported by Mr. HAWTON and Mr. SIMONDS.)

Susan G—, a thin but not emaciated child, æt. 8, was admitted into Dorcas Ward on the 8th December, 1870, under Mr. Bryant's care, with a tumour in her right upper jaw. It extended outwards to a line drawn from the outer angle of the orbit obliquely upwards and inwards to the root of the nose; inwards to the middle line, encroaching on the right nostril and pushing the nose to the left; downwards to the alveolar border of the bone; it expanded also the right side of the hard palate a little over the middle line to within an inch of its posterior border; the bulging of the alveolus was more marked in the position of the right canine tooth (Pl. III, fig. 1).

The swelling was smooth externally and very hard; it completely occluded the right nostril, but did not interfere with the movements of either the right eye or the lower jaw. The teeth present in the upper jaw were, on the right side, the central incisor and lateral, an interspace existing between the two; first bicuspid, turned outwards; second bicuspid; first temporary molar; first permanent molar. The canine tooth was missing, the lateral incisor occupying its position. On the left side the teeth were normal.

In the lower jaw the teeth were complete, with the exception of a stump of the first temporary molar on the right side.

December 16th.—For exploratory purposes, a puncture was made into the tumour beneath the cheek at a spot corresponding

to the gap in the teeth left by the missing canine tooth, but a blood-stained glairy fluid alone escaped. The opening in the bone was then enlarged by means of bone forceps and a cavity exposed, but no tooth was seen. The walls of the cavity were, however, very thick in all directions.

The patient vomited after the operation, bringing up about two teaspoonfuls of blood; the following day the soft parts were swollen.

19th.—The swelling was subsiding; a little oozing from the wound was present, but this ceased two days later; there was then no pain in the part on pressure, and the tumour was softer.

23rd.—The swelling had rather increased, and extended over the angle of the jaw; there were also some enlarged glands under the jaw. The child complained of pain when the tumour was touched, and looked very pale.

January 7th.—The removal of the bone was arranged.

10th. *The operation.*—The patient was put under the influence of chloroform, the central incisor tooth was drawn, and an incision made in the middle line of the upper lip, horizontally round the nostril, up the side of the nose to the inner angle of the orbit; the soft parts were then dissected off the upper jaw, the alveolar process cut through in the median line, the nasal process divided, and a section made with the saw of the tumour where it joined the malar bone; the mass was then seized with the lion forceps and a portion broken off (Pl. IV, fig. 1), the forceps at the time rasping what turned out to be the missing canine tooth, the fang of which was in close contact with the orbital plate of the maxillary bone; the tooth was imbedded in a mass of dense bone (Pl. IV, fig. 2 A).

The points of bone were then cut off to make a smooth surface, and the soft parts adjusted with a continuous suture. A mass of new bone, which occupied the seat of the nasal process of the maxillary bone in which the canine tooth was imbedded, was left, Mr. Bryant thinking that it would be reabsorbed now the misplaced canine tooth was taken away.

11th.—Patient did not sleep during the night, and complained of pain in the part; some blood had oozed from the nostril for two hours after the operation, when it ceased. She did

not sleep the following night, and on the 13th the cheek under the right eye was swollen, nearly closing the eye; the skin was red, but there was no pain on touch.

14th.—The stitches were taken out of the wound, and two days later the wound had healed, the cheek being a little swollen.

17th.—The swelling remained. The child was in no pain, and slept well. The cavity was syringed out daily with Condyl's fluid.

18th.—The wound had healed by primary union; the patient could breathe freely through the right nostril. Some cotton-wool was introduced beneath the cheek to keep it from sinking.

22nd.—The cavity was syringed out daily; the line of union was still slightly perceptible.

25th.—Sensibility was restored to that side of the face on which the tumour was situated.

31st.—The line of suture was still perceptible; the cavity was syringed out daily; there was a plentiful discharge of healthy pus.

March 2nd.—Mr. Salter fitted an apparatus in the mouth, which it was thought answered very well, and on the 8th she left the hospital.

August 8th, 1871.—Susan G— was readmitted into the hospital, the tumour on the right side of the bridge of her nose having grown. There was a distance of two inches between the eyes, the right being encroached upon by the tumour; the movement, sight, and position of the right eyeball were not affected. The right ala of the nose was a little lower than the left, and the whole nose seemed pushed towards the left side; the right angle of the mouth was a little drawn upwards. There was the scar left by the incision of the first operation. She said she could not blow through her right nostril. On looking up the nostril the point of occlusion could not be seen; both nostrils were narrowed. On looking into the mouth, the hard palate seemed entire on both sides; the alveolar process of the right superior maxilla was entirely absent; there was a little ashy-looking spot about the middle of the margin of the right hard palate, where the child said the false palate that was devised pressed. The apparatus did not remain firm in position; when it was out of the mouth the right cheek fell in a little. The patient could speak very well, but she was not capable of mastication.

She was fairly nourished, and seemed cheerful.

29th. *Second operation.*—Chloroform was administered, and a bistoury was passed through the upper lip from the inside; the lip was divided in the line of the former operation, and a cut made along the nose to about half an inch of the inner angle of the right eye, following the course of the former incision; the tissues were then reflected from the cheek, and the right ala of the nose lifted up. The handle of the scalpel was then introduced near the root of the nose, and a bony cystic growth separated and lifted out. The surrounding parts of bone were chipped away by cutting forceps. A large cavity was thus exposed. Bleeding was arrested by torsion and the application of Tinct. Ferri Perchlorid., the edges of the wound were brought together with silk sutures. The following day two sutures were removed from the lip, the edges having united. The patient had a little vomiting, but slept well during the night. There was a discharge mingled with blood from the right nostril; the skin over the right cheek appeared red and bright; the right eye was partly closed. Pulse 138, temp. 101·8°.

The growth removed was made up of firm fibrous tissue, enclosing numerous small cysts, the septa at parts becoming osseous. One side was covered by a bony plate, and one or two smaller bony plates were also removed.

31st.—Pulse 120, temp. 101·4°. The right side of the face was rather more swollen; the skin was red, but not so bright; the right eye was closed, and a little discharge oozed from beneath the lids; the discharge continued from the right nostril, but it was not mingled with blood; it also came from the mouth.

The patient had taken some broth, also an egg. She had slept well, and did not complain of pain, but seemed very dull.

September 1st.—Pulse 114, temp. 100·1°. Poultices were applied to her cheek.

4th.—The dressings were removed; some discharge existed.

9th.—The wound had healed, with the exception of a small sinus at the upper part. Three days later the child got up, and on the 19th the wound had quite healed. She left the hospital on the 29th of October, having had a set of teeth made, and fitted in the position of her right upper jaw.

The patient was again readmitted on the 25th January, 1872, her friends being under the impression that there had been lately

more swelling by the side of the nose. It was noticed also that the tears did not pass down into the nostril as the child cried, but over the cheek. When the child was not crying, the secretion did not flow over the cheek. Both nostrils were partially obstructed, and the child breathed through them with difficulty. The obstruction on the left side was due to the displacement of the septum.

No interference at this time was thought requisite.

November 18th.—By this time the tumour had evidently much increased, and a third operation was suggested. Mr. Bryant proceeded to remove the recurrent growth by re-opening the old incision in the median line of the upper lip and along the right ala of the nose upwards to the inner angle of the eye. He then made a section of the bone with a saw in the median line of the jaw, and turned back with a raspatory the soft parts that covered in the palate portion of the growth. He removed the bone piecemeal; one large piece corresponded to the alveolar process, the median section of which was thick and soft (Pl. IV, fig. 3 B). The rest of the hard palate was removed with the right palate bone and part of the internal pterygoid plate (c). Other pieces of disease were removed from somewhere in the region of the ethmoid and sphenoid bones. The crown of a molar tooth fell out of the growth during its removal (D). The hole left after the operation appeared as a large gap, in which neither nose nor mouth had any special separation; the whole formed one cavity. No hæmorrhage of importance took place.

The soft parts which had been turned back from the palate surface of the growth were then brought up and stitched to the mucous membrane lining the cheek, and in this way a complete palate was formed; the incision on the face was carefully brought together by fine sutures.

19th.—Temp. 101°, pulse 136. Passed a good night.

20th.—Temp. 100°, pulse 124. Doing well; takes food well.

21st.—Temp. 101·8°, pulse 124. There is some œdema of the left eyelids.

24th.—Temp. 100·8°, pulse 124. The wound has healed; sutures removed, palate perfect.

25th.—Doing well.

26th.—Patient able to eat soft food.

December 3rd.—The parts have all healed, and on examining the interior of the mouth the nostril is found to be completely shut out from the mouth by means of the mucous membrane flap which had been retained.

11th.—The patient is up and about the ward.

20th.—Patient convalescent.

Report by Dr. Goodhart.

The parts removed at the third operation consist of the posterior part of the hard palate with the right palate bone tuberosity; some smaller pieces, with thin plates of bone projecting at angles from the main plate, and having the appearance of ethmoid; and some dark red soft material as well (Pl. IV, fig. 4). Most of the bone, except that portion of the hard palate removed, is very soft and spongy, the cancelli being filled out with a plentiful supply of dark red substance similar to the soft parts of the growth. This is seen as well on the cut surface of the new bone, towards the median line, as in the deeper parts, so that it must be taken as proved that part of the growth extends across the median line and has been left behind. The thin plates which appear to belong to ethmoid, or possibly to the lower wall of the sphenoidal sinuses, are healthy, so that in this direction backwards the growth has not extended.

A microscopical examination of the growth in its recent state showed its embryonic nature. What stroma there was, appeared to me to be formed by spindle cells of varying size, while in the meshes thus formed, and which were easily destroyed by the isolation of the component cells, were large myeloid cells, and also granulation-like cells, with a large, sometimes single, sometimes double nucleus. The myeloid cells were crowded with nuclei (Pl. VIII, figs. 3, 4, and 5). The bone in the tumour appears to be good bone. It will thus be seen that, though belonging to the class of myeloid sarcomata, it had so much of the spindle-cell type that I at first thought that such was its true nature, and it is at least open to conjecture still as to the proper nomenclature of such a growth. Is it that we have here a spindle-cell sarcoma manifesting a tendency to the production of myeloid cells by reason of its occurrence in a young person? Is it that the growth, originally from the medulla of the bone—a myeloid growth—is so rapid in

its development that we see in it only a mere wreck, or rather a shapeless mass—shapeless, I mean, not only in its aggregate as the tumour, but in its ultimate atom, the single cell, which is without any constant form? Or is it that we have a bone growing here—not one part of the bone, as the medulla or lymphatic tissue or periosteum, but the whole group of tissues making up bone—all involved in this whirl of aberrant development? Such questions, of passing interest, as it seems to me, in the life history of this and all tumours, I cannot answer. I had almost said to settle them would be to destroy much of the interest which such diseases excite. The fact that much of this tumour has formed good bone, however, may be thought to disprove, at any rate, one of these conjectures.

Remarks.—This case is a very remarkable one, and in its pathology it is not quite clear. From its history and treatment several important practical points are to be gathered, which are worthy of attention.

The time of life at which the disease appeared, the absence of the canine tooth, and the almost painless character of the swelling, suggested at once the idea that the tumour was due to a misplaced tooth, and the probability that the swelling was merely a dentigerous cyst, such as I have recorded in Case 2, was the first natural thought. A closer inspection of the case, however, did not encourage this idea, for it will be seen by the drawings that, whereas in the case of dentigerous cyst (Pl. II, fig. 1) the swelling occupied the lower border of the maxillary bone, in the case just recorded the whole body of the bone was involved in the disease, and more particularly its nasal process (Pl. III, fig. 1). Nevertheless, I thought it right to explore the tumour before I undertook its removal, and with that object carried out my first operation.

The information I gained by this exploratory operation was, however, negative; a cyst, or rather cavity, was opened, which was surrounded by dense bone, but no tooth was found.

The second operation was, therefore, planned, and the extirpation of the jaw was its object, for I hardly realised the idea that such a solid tumour as the one I had to deal with appeared

to be could be the result of a malplaced tooth, although the possibility of this being the case was before me. The truth, however, came home to my mind at the operation, when the rasp of the bone forceps against the canine tooth, situated below the orbital plate of the bone I was removing, revealed its nature. I regarded the growth, however, as an inflammatory one, and upon such a supposition I was induced to leave the portion of the growth that occupied the nasal process of the superior maxillary bone; for I naturally thought that if the disease were inflammatory, and due to a misplaced tooth, the inflammatory thickening would subside on the removal of its cause—the missing canine tooth; and this had been taken away with the thickened bone (Pl. IV, fig. 2). In this view, however, I was clearly mistaken, for the subsequent increase of the disease that was left, as described in the report, called for a second operation.

At the second operation I removed what I believed to be all the diseased tissue, for I could not make out the presence of anything that looked like infiltrated or thickened bone, but in this I must have been wrong, for the recurrence of the tumour within six months, and its subsequent steady growth, necessitated a third operation sixteen months after the second; and looking at the case pathologically, I fear another operation may yet be demanded, for on reading the pathological report by Dr. Goodhart it will have been observed that the section of the palate and alveolar portions of the bone was infiltrated with the myeloid elements, and it is consequently to be feared that these may multiply. I shall therefore watch the case with care, in order that, on the first appearance of the disease in the bone of the opposite side, its speedy removal may be effected.

On looking back upon the case it would, therefore, appear that the opinion I originally entertained of its nature was the correct one—the disease was not a simple inflammatory enlargement of the bone, due to a local central irritation, but a new growth, a myeloid sarcoma; and this new growth, in all probability, had been set up by the presence of a malplaced tooth.

Such a fact was not new to me, for in 1869 I recorded a case of cancer of the upper jaw that had clearly grown round a malplaced molar tooth ('Guy's Rep.,' vol. xv, series iii), but the

case I now record is the first that I have seen in which a like cause appeared to give rise to the development of a myeloid tumour.

On another occasion, should a like or allied case fall into my hands for treatment, I shall be less sparing of my bone forceps. I shall remove the whole of the diseased tissue, and leave only the plates of bone that line the cavities; every suspicious piece shall be taken away.

CASE 6.—Tumour of Left Superior Maxilla; Removal of Bone; Recovery.

(Reported by Mr. J. C. WILKINSON.)

Morris E—, a Welsh labourer, æt. 52, and whose family history was very good, was admitted into Accident Ward on the 22nd August, 1873. He was brought up to Mr. Bryant by Mr. Robert Roberts, of Portmadoc, Carnarvonshire. He had a large swelling on the left side of the upper jaw, including the whole of the left side of the palate; it was about four inches in diameter, not nodulated, but firm, semi-elastic, and painless. The cheek was much distended, and the left nostril obstructed, the left eye was partially closed, and the head rather painful (Pl. II, fig. 3).

Twenty years before, the patient had some illness, but did not know what it was; otherwise he had always enjoyed good health. He said that, ten months before admission, he first noticed the swelling and pain about the left side of his upper jaw, and also that his nostrils appeared to be getting blocked up. Thinking that the pain proceeded from his teeth, he had three or four taken out, but the pain still remained, and continued to get worse, the swelling increasing at the same time. He could give no reason for the cause of the tumour, and no history of a blow. The removal of the disease was determined upon.

August 22nd.—Chloroform having been administered, a vertical incision was made through the centre of the upper lip, and a second from the inner angle of the eye around the ala of the nose to the bottom of the left ala; the cheek flap was then reflected and the tumour exposed; the alveolar process was sawn through opposite the left lateral incisor, which had been previously removed; a second section of bone was made through the malar process; and a third, transversely through

the nasal process, near the inner angle of the orbit; the whole tumour was then prized out by the elevator, scissors being used to detach it from the pterygoid plate. All bleeding was arrested by torsion, and the cheek flap adjusted by sutures.

On its removal the growth was found to be of the carcinomatous type, occupying the antrum and hard palate, pressing out into the cheek.

23rd.—Temp. $101\cdot6^{\circ}$. The patient had been very sick, and brought up some blood; his throat was very painful.

26th.—Temp. $100\cdot4^{\circ}$. Was very comfortable; had only a little pain in the inside of his cheek. His face did not look at all deformed. The mouth and nose were syringed out every day with Condyl's fluid.

27th.—All the sutures but one were removed. The man looked very comfortable, and could swallow food more easily.

30th.—Temp. $103\cdot6^{\circ}$. The patient was not quite so well, his throat being very sore. He had injections of beef tea every four hours.

September 7th.—All the incisions had healed well, the edges of the hole in the roof of the mouth were healthy looking, and he took slop food well. He got up every day, and on the 19th left the hospital, the wound seeming healthy.

January 20th.—From a letter Mr. Bryant has received from Mr. Robert Roberts a return of the disease has taken place.

Report by Dr. Goodhart.

The pathological appearances in this case may very well be described in connection with some further remarks that will be made in relation to Case 4. The two tumours need to be contrasted in their divergencies from each other; they need to be compared in their likeness to one another, to bring out into relief their significance and teachings in relation to abnormal growth. They both belong to the class called fibrous, but neither, let me say at once, have such characteristics as will allow of their being termed *fibroma*, in the ordinary acceptation of that term.

Fibrous tumours, one might almost say, are of two kinds—fibrous and non-fibrous. By the former I understand such solid tumours as are found in the uterus and jaw, for instance, where the microscopical features are a uniform, wavy, hyaline

substance, with elongated masses of protoplasm or nuclei throughout it, the whole tissue, both nuclei and substance, forming one intimately blended whole, which is not easily picked to pieces or teased into a separation of cell and fibre. In the latter we recognise a tumour, also occurring in similar regions, which has somewhat the microscopical features of the subcutaneous tissue, and is made up of an open network of wavy fibrous tissue, with sometimes some elastic tissue and a free production of round nuclei in the meshes and among the fibres. Now, the former would appear to grow by a process of fibrillation, which involves no more disputable point than the very old one, viz. whether the fibre is produced by elongation of a cell, by the conjoined borders of contiguous cells, or by a distinct process in gelatinous tissue, in relation to which the influence of the cell, if any, is undeterminable. The tissue is, in fact, an exact counterpart of tendinous, or, as it is called by Rollet,¹ fibrillar connective tissue; and the difficulties met with in the interpretation of the development of the normal substance are the same when attempting to decipher the appearances enumerated in a tumour. At the same time, in discussing one point, another more important one is settled by so doing without dispute, for a tumour of this character, by its exact similarity to the normal tissue, is, in so many words, declared to be of an innocent tendency. Of this kind, in some part, is Case 4 (Pl. VIII, fig. 1). The other, to which both our tumours, but more especially Case 6 (Pl. VIII, fig. 2), belong, has this additional difficulty, that while it is in part made up of many fibres, its cell elements are round leucocyte-like bodies, and quite unconnected, as far as can be seen, with the fibres with which, if corresponding to the fusiform bodies in tendinous structures, they must be supposed to have some relation, in the matter of development and growth. In this class of tumour we have the embryo in the cell; there is the adult in the fibre; but the transitional stages are completely wanting; and to get any clue whatever as to the process that goes on in the development of such a tissue we have to go to another class of growth altogether, the spindle-cell sarcoma, and we may then, perhaps, infer from such that the rounded cells here become elongated into spindles, and then into fibres. This is by no means satisfactory. That a tumour is confessedly

¹ Stricker, 'Human and Comparative Histology,' vol. i, Syd. Soc.

increasing, and yet on investigation no evidence of the transition stage is to be found between immaturity and its opposite, is so adverse to the *à priori* conception, arguing from other sources, of what *must* be the condition in this instance, that one is indisposed to admit more than, that from the imperfection of the observation only is it that the intervening progress of such tumours between their beginnings and completion is unregistered in their morphological elements. It will not be so under the light of further investigation. When the "imperfection of the geological record" shall have been cleared up, then will be produced the missing link between the monkey and ourselves. At present, let me repeat it, there is a form of connective-tissue tumour, nay, more, there is a variety of connective tissue, apart from all question of tumour, which has this curious admixture of embryo life and mature development, and how the one passes into the other, in spite of all the work that has been done in connection with this subject by Beale, Virchow, Henle, Max Schultze, and many others, we do not know.

In attempting thus to give some general sketch of the relations which certain classes of tumour bear to others more or less decided in their affinities, beyond taking our two cases as a text but little has been attempted in the special description of each, and they have both hitherto been compared rather than contrasted. I must now add that, while much of their structure is composed after the tendon type or fibrillated connective-tissue tumour, some of it also has all the characteristics of the second group. To say this does not at all invalidate the remarks just made on the absence in these growths of transitional parts. It has nowhere been said that the two conditions are not related, but it has everywhere been implied, if not distinctly stated, that they are the same kind of tissue putting on different appearances at different periods of its life. Our example would seem to enforce this probability; it also adds strength to the remark that between the formed and unformed elements no steps are visible. In Case 6 another feature must be taken into account—the tumour occurred in an old man. It consists of very thick areolæ of fibrous tissue, the meshes of which are filled with rather large round cells (Pl. VIII, fig. 2). It is, according to recent nomenclature, a medullary sarcoma. I have not attempted to view it in its purely histological character, but have rather been

endeavouring to indicate or explore by its aid a point or two in the general pathology of tumours. Perhaps to have gone no further than to ticket it medullary sarcoma would have been wiser; that would have told of its malignancy, the point of knowledge that once reached suggests that calm sea of rest and thankfulness so satisfying because so undisturbed. But why is it malignant? To say that it is a cell growth chiefly, and not a tissue growth, is no answer to the question, else were all inflammatory cell products and granulation tumours malignant. Still, to say that tumours of formed tissue—homologous—are innocent, is mostly true, as also is it to say that cellular tumours are to be suspected. The point is too wide to enter upon; enough now that here lies the difference between the two tumours—the one, constructive, is called a fibrous tumour; the other, rather conglomerate, is a medullary sarcoma and infiltrating, and occurring in an old man. Then, granting on these grounds its malignant nature, we may finally revert for one moment to the original question—the relation between cell and fibre—to say that there is in this case a possible explanation of the absent intermediate stages which was not permissible in the other, viz. that the two parts of the tumour formed at different periods; that they are really two distinct growths moulded into one, that of the formative period being represented by the fibrous part, that of old age by the cellular; the one not necessarily being connected with the other, except that they have a seat of origin in common. Some still hold that the cancer of later years is perfectly distinct from the cicatrix or innocent tumour of early life, even though the two things occur in the same spot. I should be sorry to give in my adhesion to that hypothesis, and should rather state it thus—that the results would have been identical had the process been carried on in both cases under similar conditions; that the tendency to growth is the same in both cases; but if the young tissue or the cells are forming with abnormal rapidity, neither time nor energy is left to bring such elements to maturity.

Remarks.—This case, in its clinical aspect, will not claim many remarks; it is given as a very good example of a cancerous tumour of the upper jaw; it occupied the whole bone, and af-

fect every part equally ; it involved, moreover, the palate bone. It was, as most cancers of the jaw, of a somewhat rapid growth.

The practice that was followed in the case was the only possible one. No partial operation could have been entertained, and the direct result of the operation was very satisfactory.

With respect to the operation itself little has to be said. In this case, as in the others previously recorded, it will have been observed that Fergusson's incision was the one always employed, that is, the one into the nostril and along the border of the nose to the inner angle of the eye, this incision readily allowing the surgeon to take away almost any tumour of the upper jaw. In some cases the incision may be supplemented by a transverse cut along the lower border of the orbit, but no other is really called for. Such an incision as the one formerly made, from the angle of the mouth upwards and outwards towards the zygoma, ought never to be executed.

TUMOURS OF THE LOWER JAW.

CASE 7.—*Tumour of the Inferior Maxilla (Fibroma) ; Excision ; Recovery.*

(Reported by Mr. W. BROWN.)

George S—, a sailor, æt. 25, was admitted into Job Ward under Mr. Bryant's care on April 28th, 1873. He had been previously admitted into the hospital on December 18th, 1872, but left again on the 21st to go to India with his ship.

On his first admission there was on the right side of his lower jaw a growth causing an oval swelling, which extended from the right corner of his mouth backwards almost to the angle of the jaw. Above, it did not extend beyond the line continuous with the mouth, but it extended below considerably under the jaw into the submaxillary triangle. The skin over the swelling was quite healthy and not adherent ; the greater part of the surface of the mass was nodulated and elastic, but there was one prominent and apparently bony piece to be felt. On the present occasion the tumour was of the same form, but larger ; it was immovable and quite free from pain ; it protruded much into the mouth beneath the tongue fossa, the growth ex-

tending backwards from the first bicuspid, about one inch long and half an inch wide; there was a slight ridge between it and the surface of the gum, with which it was nearly level. The tumour could be seen in the mouth, occupying the space between the jaw and the teeth. It was ulcerated at its posterior part, showing a sprouting edge. The teeth were absent behind the first bicuspid to the last molar, which was somewhat imbedded in the tumour (Pl. V, fig. 1). The glands in the neck near the tumour are slightly enlarged.

It appeared that seven years ago the patient was struck on the right side of his lower jaw by the mainsail of a ship. He was unable to eat anything solid for a week after, and had never been able to bite anything hard on that side since. He did not know if the jaw were fractured, neither did he notice any swelling about the face at the time. About three years ago, however, a slight swelling appeared on the right side of his lower jaw. He consulted a surgeon, who first called his attention to a small growth, and removed two teeth. Six months later two thin, flat scales of bone, about half an inch in diameter, came away through an opening in the mouth, and a short time afterwards another piece followed. The swelling gradually increased, and on the 14th the swelling in the mouth was opened, and some pus let out.

It appeared that his family history was good; he himself was a strong, healthy looking man; he had never had syphilis, but has had jungle fever when in India.

May 2nd. *Operation.*—The patient was put under the influence of chloroform and the right canine tooth extracted. An incision was then made, about three inches in length, along the lower border of the inferior maxillary bone, and the facial artery, which had been divided, was twisted. After all bleeding had stopped, the mucous membrane was divided from the inside of the mouth, the soft parts separated from the tumour, and with a chain saw the bone was cut through anteriorly just a little to the right of the symphysis, and posteriorly close to the angle of the jaw. In this way the bone was removed with the tumour attached (Pl. V, fig. 2). On examining the section of the bone near the symphysis a portion of the growth was seen to have been divided in the centre of the bone and been left in. This was at once scooped out of its

cavity, a clean surface being left. A sponge with string attached was placed in the mouth, and the external wound was stitched together. There was a little hæmorrhage from the mouth about two or three hours after the operation, but it was easily arrested by ice.

3rd.—The man slept a little; there was no bleeding; he took a little milk. Pulse 102, temp. 100°.

4th.—Pulse 96, temp. 99·3°. Slept better.

5th.—The stitches were removed. The man's improvement was uninterrupted. He got up on the 13th, and left the hospital on the 19th, with instructions to appear twice a week.

July 10th.—This patient appeared at Guy's to-day. He was quite well. The jaw was slightly oblique, from being drawn towards the affected side.

The following report of the preparation is from Dr. Goodhart:

Fibroma removed from the Lower Jaw.

The growth was from the right side of the lower jaw. It bulged considerably externally, and also encroached much inwards upon the floor of the mouth.

The section (Pl. V, fig. 3) shows a gelatinous-looking growth, with white and glistening bands across it, which is free as tumour above (alveolar part), but below is encysted in the bone. It is separated at all parts of its circumference by fibrous material, and here and there by a distinct fibrous capsule. The bone is not affected other than by a process of absorption, producing a cavity, from the pressure of the growth, and into which the tumour is received.

Microscopically, it is made up of loose fibrous tissue, as depicted in the sketch (Pl. VII, fig. 1). As to its origin, from the mode in which the bone is affected, it might either have formed inside the compact layer, and then by absorption of the outer part have pushed outwards into the mouth; or else, having caused absorption of the bone from above, it might have grown into the cancellous bone, and thus, acting as would a tumour from within, have caused the expansion of the whole ramus, as existed on its removal. From the fibrous nature of the tumour, and its still distinct isolation from the bone, I am inclined to concur in the latter view, and to regard it then as a

fibrous epulis, originally distinct from the bone. But it has many peculiarities which make it difficult to sketch its probable history. Its gelatinous look and loose, flickering consistence render it unlike this class of new growths: these are of importance in connection with the previous history of injury and possible inflammatory origin. It has, however, as far as can now be seen, no periosteal connections.

CASE 8.—*Spindle-cell Periosteal Sarcoma of Right Ramus of Lower Jaw.*

(Reported by Mr. JOHN BRETT.)

Julia L—, æt. 20, a gold-lace trimmer, was admitted into Guy's on December 30th, 1872, Mr. Bryant having seen her in consultation a few days before with Mr. Gardiner Brown.

Her mother had died from cancer of the mamma.

Three months ago she discovered a swelling on the inner side of the right ramus of the lower jaw, and, thinking it was a boil, she pricked it. The swelling increased and she applied to a doctor, who took out two teeth, but without relief, the pain being constant. The growth gradually grew, but during the last three weeks the swelling has very rapidly increased.

On admission.—The right side of the face is swollen, and the whole horizontal ramus of the right side of the lower jaw much enlarged. The swelling was visible below the bone, and within the mouth it extended from the angle of the jaw forwards as far as the incisor teeth.

A sloughing fungous mass was visible on opening the mouth, and one molar tooth rested in the centre. The bulk of the tumour appeared about the angle of the jaw, and on its inner side. The bone did not appear to be expanded. Nothing but the removal of the disease could be advised.

December 31st. *Operation.*—Chloroform mixture was given, and the operation for the removal of the jaw performed; Mr. Bryant made an incision below the horizontal ramus of the jaw down to the bone, and a second through the median line of the lip; he then carefully separated the tumour from its connections with the soft parts within the mouth, reflecting the flap upwards; all the vessels were twisted. The tumour was then

exposed, and the chain saw introduced from beneath the bone into the mouth and through its orifice, at a part corresponding to the canine tooth which had previously been removed. The bone was then divided, and the section appeared healthy.

The soft parts were next carefully separated from the bone, the masseter muscle divided, and the periosteum above the angle of the jaw carefully pressed off the ascending ramus with a blunt knife and the finger, this measure carefully detaching the insertions of all the muscles of the part, and guarding the vessels from injury. The stylo-maxillary ligament was divided by scissors.

The bone was then with marvellous facility twisted from its socket (Pl. VI, fig. 1); no bleeding followed. By way of caution, a piece of sponge was placed in the wound, and the cheek flap carefully adjusted with a continued suture of fine silk. Immediate union took place. On January 6th the stitches were removed, and a mould was applied to keep the parts together. By the tenth day the new material, hard to the finger, had been poured out, as if a new jaw was forming. No swelling or pain appeared about the articulation. The girl can speak distinctly, and can move the jaw. She left the hospital on January 18th.

May 4th, 1873.—This patient is still quite well; has good movement and power in her jaw; can eat well, but she cannot bite any hard things.

In August some swelling reappeared in the region of the old disease, and this appeared to be connected with the upper jaw. This steadily increased, and proved fatal on October 4th, 1873, about nine months after the removal of the disease.

The tumour at the time of the patient's death was the size of her head; it had caused death by suffocation.

The pathological report of the tumour by Dr. Goodhart is as follows:

Periosteal Sarcoma of Lower Jaw.

This tumour was a very pretty specimen of periosteoma, or new growth of the periosteum. Macroscopically, it had all the features of such a tumour, *i. e.* it surrounded the bony substance with a layer of soft material, imbedding it in its substance, while one section of the bone was still quite healthy

in structure and density; it had the usual arrangement of fibrous bands in a direction vertical to the plane of bone surface at any one spot, and calcareous matter had a tendency to be deposited in like manner (Pl. VI, fig. 2). It was of firmish consistence at the lower part, but towards the mouth it was exceedingly soft.

An examination of the fresh tumour by teasing showed mostly cells and nuclei of the spindle type. The cells were some of them exceedingly well formed. After hardening the growth, its spindle-cell relations are not so apparent, but, as shown in the plate (Pl. VIII, fig. 3), it has all the appearance of a round-cell sarcoma. The connective-tissue meshwork is rather more succulent than usual, and the nuclei are by no means in great numbers.

It may serve to illustrate the necessity which always exists of examining new growths in as fresh a state as possible, as well as after steeping them in the various solutions used for hardening. More, I think, is learned from the former than the latter condition. It also serves to show, as indeed almost all, if not all, tumours do, the evils of a name. We call things spindle-cell sarcomas, and round-cell sarcomas, and endless other "omas," and once they are ticketed it is difficult to reassociate them in the minds of students with others which are closely allied to them. New spindle-cell growths, the "recurrent fibroid" of Paget; round-cell growths, the "fibro-plastic" of former days; and myeloid growths, are most commonly associated as periosteal tumours; in any one growth all three will very likely be found, while, inasmuch as they are each and all founded in tissue whose tendency is to form bone, they will probably be made up also in part of bone. The term osteo-sarcoma has no meaning for us now *quoad* the real nature of the growth; it tells us no more than we can see with the eye, that the mass is composed of bone and flesh. In all tumours of bone will its own tissue like enough be reproduced. In a part away from any such influence, the formation of bone is exceptional. In the case before us three varieties out of four—the myeloid excepted—of connective-tissue tumour are represented.

But, further, the recurrent fibroid has been termed semi-malignant, from its inveterate habit of recurrence. The fibro-

plastic used to rank as an innocent growth, and even now it is said that the round-cell sarcoma is less liable to return than the spindle-cell variety. I will not quarrel with an opinion which is, as in this instance, I apprehend, founded on experience; only let us take the tumour under consideration as a reminder, and by no means an isolated one, that the one form may be as malignant as the other. What growth could be more horribly malignant than this?

Remarks.—In the two cases just quoted portions of the lower jaw were removed on account of the development of a new growth. In Case 7 the tumour originated within the bone, and expanded its cavity, whilst in Case 8 the disease sprang from the periosteal membrane covering the bone.

In the first case, from the knowledge gained by the operation, it may fairly be a question whether the removal of the bone was really necessary, for at first sight there seemed to be good reason to believe that the greater part of the growth might have been scooped out of its bony bed, and the jaw-bone have been saved, and there is no doubt that a large portion of the growth might have been thus treated; but from the condition of parts found at the operation there seems too much reason to believe that if this form of operation had been selected, that portion of the tumour which had found its way into the very centre of the bone, and had been divided when the anterior section of the bone was made, would have been left behind, and that it would probably have grown, and given occasion for a second operation.

From this clinical point of view I am disposed, therefore, to think that the operation I performed was the best under the circumstances, and that any less complete measure would have been a failure. I say this, however, under a very strong conviction that nothing but an urgent necessity is enough to sanction the removal of any portion of the whole thickness of the lower jaw, and that the freest section of diseased parts from within the mouth ought to be employed in the majority of cases before any more serious operation is undertaken.

In fibrous tumours, and in those usually described as epulis, this clinical rule of practice ought to be imperative.

In Case 8 no doubt can be raised as to the wisdom of the practice that was carried out. No partial operation could have been entertained, and no less complete one than that undertaken could possibly have been successful.

That the operation failed to save life was due, not to any defect in its execution or design, but to the nature of the tumour, the growth, if not pathologically cancerous, having, clinically, a strong affinity to the cancers.

In the linear arrangement of the diseased structure (Pl. VI, fig. 2) may be read the typical appearance of the periosteal sarcoma, and in the predominance of the cell element within the meshes of the fibrous stroma may be traced the connection between this form of tumour and the cancers, for tumours of the jaws, as of other parts, are benign to a degree corresponding to their fibrous elements, and cancerous to a degree corresponding to their corpuscular.

In Case 7 the tumour was, doubtless, benign, being composed almost entirely of fibre-tissue.

In Case 8 the tumour was as doubtless malignant, being made up so largely of cellular connective tissue.

Clinically and pathologically, therefore, the features of these cases may be said to be complete, and they may be accepted as types of their own kind.

With respect to the operations performed, little requires to be said. In the case in which only part of the lower jaw was taken away the incision, which was made, was limited, but it was amply sufficient, and any longer incision, or any division of the lower lip, would have been quite unnecessary. The wisdom of dividing the bones carefully down to the mucous lining of the mouth, and the arrest of all bleeding by the torsion of the divided vessels, before opening the cavity of the mouth, is a practice which, in all jaw operations, should always be carried out, for it removes one source of difficulty in all mouth operations performed under the influence of chloroform—that which attends the trickling of blood into the mouth and into the respiratory tract.

The advantages of the division of the bone by the chain saw are such as every surgeon will acknowledge, who has tried it.

Explanation of Mr. Bryant's Plates—continued.

From drawings by Dr. GOODHART.

PLATE VII.

Fig. 1. Fibrous tumour of the lower jaw from the patient figured on Plate V. It shows a loosely arranged fibrous tissue, which, after removal, had rather a gelatinous appearance. $\frac{1}{4}$ -in. object. Camera.

Fig. 2. Exostosis of frontal sinus. A section of the tumour figured on Plate I. to show the irregular arrangement of Haversian canals and bone lacunæ. 1-inch object. Camera.

Figs. 3 and 4. Vertical and transverse sections of the preceding under high power. $\frac{1}{4}$ -in object. Camera.

PLATE VIII.

Fig. 1. Fibrous tumour of upper jaw, illustrative of the remarks appended to Case 4. It shows a thick alveolated fibrous tissue with round nuclei scattered about. $\frac{1}{4}$ -in object. Camera.

Fig. 2. Medullary sarcoma of the lower jaw (Plate II, fig. 3).

a. Large round nuclei aggregated together in spaces formed by

b. Rudimentary fibrous tissue.

c. Fibrous tissue merging into sarcoma tissue, with its more regular arrangement of small spaces formed by delicate connective tissue, each space containing one nucleus similar to those seen in the clusters elsewhere. $\frac{1}{4}$ -in. object. Camera.

Fig. 3. Illustrative of the histology of periosteal sarcoma. Plate VI. $\frac{1}{4}$ -in. object. Camera.

Fig. 4. Myeloid sarcoma, to show the relation of the myeloid or giant-cell to the surrounding round-cell sarcoma tissue.

a. Round-cell sarcoma tissue.

b. Myeloid-cell.

c. Capsule of cell. $\frac{1}{4}$ -in. object. Camera. See also Plates III and IV.

Fig. 5. Varying forms of cell, as seen in this and other myeloid tumours. $\frac{1}{4}$ -in. object. Camera.



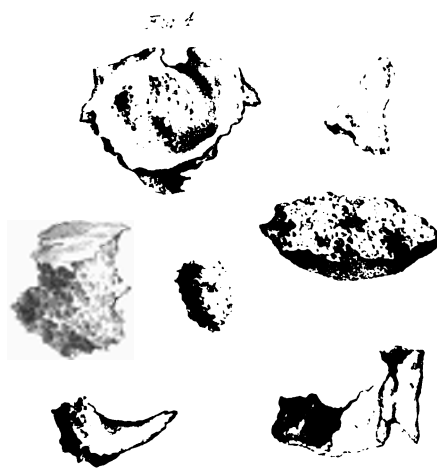
Fig 1

Fig 3.



Fig 2





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Fig. 1



Fig. 3



Fig. 2



Fig. 1



Fig. 3



Fig. 2



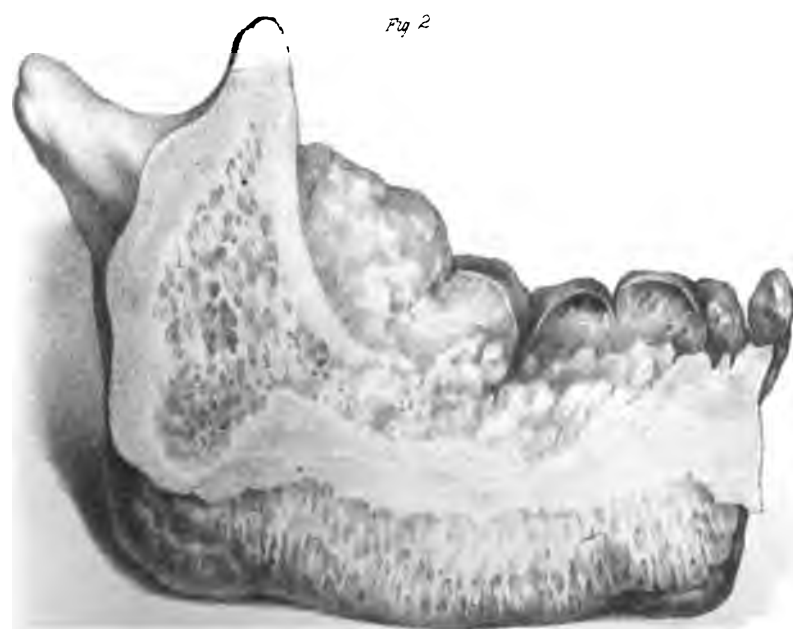
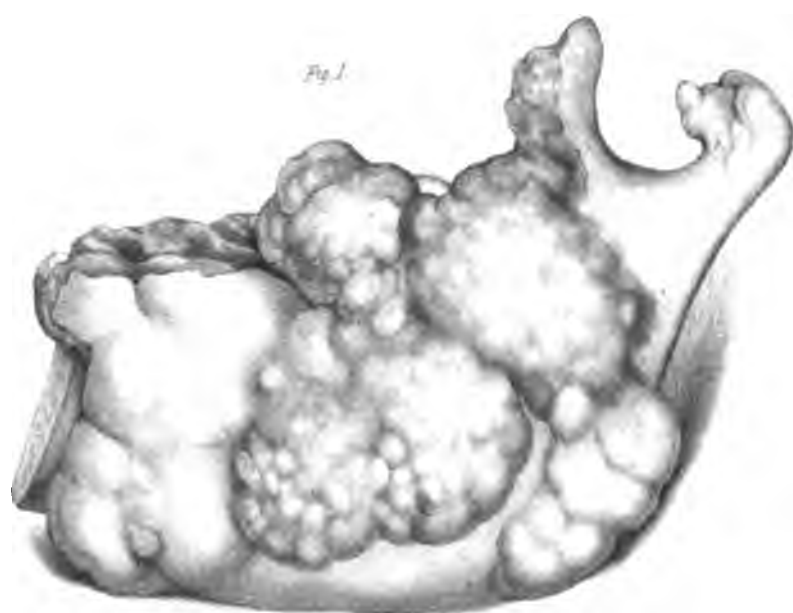


Fig. 1



Fig. 2.

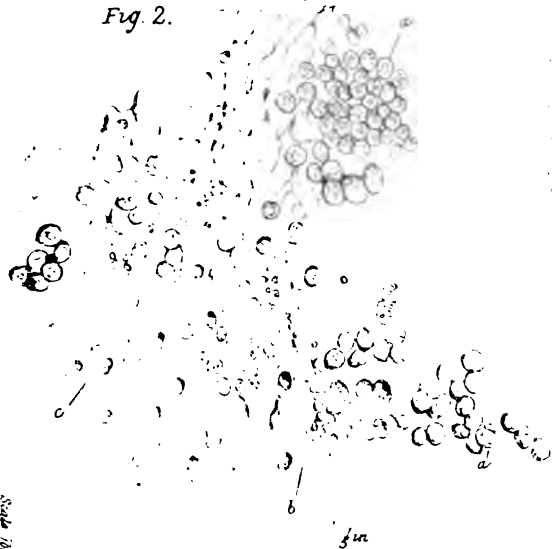


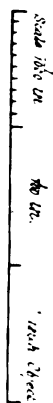
Fig. 3.



Fig. 4.



Fig. 5.



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PROGRESSIVE LOCOMOTOR ATAXY AND OTHER PROGRESSIVE PARALYSES.

By J. THOMPSON DICKSON, M.B.

THE following case of progressive locomotor ataxy presents in its details several rare and extraordinary features, and I have recorded it with a double object; firstly, on account of its interest and rarity of detail, and, secondly, because it bears importantly upon the grouping together of the several forms of paralysis which are progressive in their character, and in particular upon the condition of mind presented by the subjects of progressive paralysis.

The patient, a lady, was under my care for about two years, and died about a year ago. The history of the case was related to me partly by the patient herself and partly by her friends. She was married at the age of sixteen, but never became pregnant until seventeen years after marriage, nor until after the progressive locomotor ataxy had become definitely pronounced. The first symptoms were numbness of the left foot, gradually creeping upwards, followed by numbness of the right foot. The patient then began to notice that she was unsteady in her gait, and unless she gave attention to her movements she would stumble and fall. These points became impressed upon her mind, and affected her spirits, for she had been in the habit of taking a great deal of exercise. She gradually grew worse. After a time (about nine months) she took to a stick, with which she was able to hobble about. She then became

pregnant, and in due time gave birth to a male child. During her pregnancy the numbness of the feet and legs increased so that her gait became shuffling and uncertain, and she could not progress without assistance. She also suffered from gastric irritation to such a degree that she became alarmingly emaciated, and the infant, when born, was so badly nourished that its life was only preserved by the great care which was bestowed upon it. It was nourished by a wet-nurse, and after a little while did very well.

The mother was delivered whilst standing, as the usual position, when she was placed in it, was attended with unbearable distress. The labour-pains were weak, the labour was protracted, and, though uncomplicated, the recovery was tedious.

Her friends and advisers naturally expected that the sickness and vomiting, which had persisted through her pregnancy, would cease soon after her confinement, and they buoyed her up with this hope; but their expectations were doomed to disappointment, for the vomiting continued with increased violence after her pregnancy, and, with a few slight intermissions, persisted until her death.

I first saw the patient about four months after the birth of her child and about twenty-two months after the commencement of her symptoms. She was then much emaciated, and unable to stand without support, though, with the assistance of another person, she was able to walk a short distance—perhaps half a mile—but with a shuffling or shambling gait, which, at times, was jerky and hurried. She barely raised her feet from the ground, and had only just so much sensation in her feet as to enable her to know that they were on the ground. Her legs were wasted almost to skeletons, as also were her arms; and the muscles of the trunk, particularly those of the abdomen, were atrophic; the interossei and the adductores pollicum too, were much wasted, but in each case the left side was worse than the right. Some, but not all, of the muscles responded to the stimulus of faradization, and some, particularly some which seemed to be most wasted, after a short application of the battery, contracted under stimulation of the continuous current. The patient's tactile sensations were only sufficient to appreciate powerful voltaic currents, except in the lower dorsal region of

the spine, for about three inches, where she could only bear a very slight current. She maintained, however, the power of discrimination in regard to hot substances. She could feel a hot spoon when it was applied to her skin, though the usual delay in the appreciation of the warmth, after touching the skin (which such cases always more or less exhibit), was very characteristically marked. Her abdomen in particular was wanting in tactile sensibility. Her vagina, from which a slight discharge was issuing when I first saw her, was flabby and senseless to the touch. Her uterus was slightly anteverted. Her liver was distinctly definable through the attenuated walls of the abdomen, but it was very small and evidently shrunken. Her abdomen generally was flabby, all the viscera could readily be made out, and the abdomen contained no tumour or swelling of any kind. Her urine was often voided involuntarily, and at times unconsciously. It was free from albumen. At this time her second, third, fourth, and sixth cranial nerves apparently were unaffected, for she then had neither amaurosis, amblyopia, diplopia, strabismus, nor ptosis, though all these symptoms occurred before she died; but the fifth and seventh nerves were slightly affected. She could close her eyes, but all the muscles of the face moved irregularly in the act. The sensation of the face was impaired, the sensibility of the mucous membrane of the mouth, too, was so much diminished that food would collect in her cheek and she was unable to tell that it was there; the sense of taste also was almost gone. Imbibition of fluids was difficult, and the saliva would flow over her lips and from the angles of her mouth; the amount of saliva which she daily lost was very great.

She complained of severe neuralgic pains in the legs, which were of a very sharp lancinating character, and of an agonising dragging pain in the belly. She had menstruated since her confinement, though slightly, but her painful symptoms were all augmented at the menstrual periods. She sometimes suffered great pain in her back, and complained particularly of a pain below the scapulæ, which pointed, I thought, to some important implication of the liver, and she stated that the shoulder pain, sickness, and pain in the belly, alternated with the lancinating pains in the legs. She often complained of pain beneath the right scapula when the abdomen was galvanized.

I was unable to trace any cause in her family history, which was singularly clear of nervous disease. Her father and mother were both living and in excellent health, as also were her brother and sister. She told me that she used, at one time, to amuse herself with a sewing machine, which was worked with a treadle, and she seemed to think that her malady was due in some way to it, but she had never used the machine to any extent. At one time she was in the habit of standing much, and in a frequent draught. She thought that this had affected her. A more possible solution of her malady was a febrile attack from which she had suffered three years before. This attack was stated to have been scarlatina, to have been very slight, and only to have laid her up for about a week. Some time after this she suffered from pains in the loins. The doctor who attended her told her that she had "caught cold in her kidneys." I could not learn whether she had albuminuria; at all events, she had no dropsy. I expressed my opinion to her friends that she was suffering from degeneration of the spinal cord, and I concluded that the posterior columns were the seat of lesion, and that probably the lateral columns and the multipolar cells of the grey matter were affected also. In the lower dorsal and upper lumbar regions the changes appeared more active than in parts above and below, and it had possibly extended more deeply into the cord in these parts than elsewhere, though the change had not progressed sufficiently to dissolve the continuity of the conducting fibres.

The patient told me that she had seen numbers of doctors, and had taken a great deal of physic, but that none of it had done her any good—in fact, she found herself becoming worse and worse.

I at first ordered her to be galvanized, the current to be passed along the cord, and the application to be directed particularly over the stomach, bladder, and left thigh. After four days the sickness ceased, and was absent about a fortnight, during which time she was able to take more food and gained a little appetite, but on the eve of her menstrual period the vomiting returned. I ordered that the galvanism should be persevered in, but I soon found that the muscles began to contract less readily, and no effect was produced in them with less than twenty cells of Stöhrer's constant-current battery. In

about a fortnight, however, the skin became very sensitive, and she could not bear, on account of its painfulness, the current of more than six cells. The muscles of the left thigh and buttock continued very much wasted, and were very flabby.

A fortnight later the sickness was again the prominent symptom, and I ordered her the *Pil. Assafœtidæ* Co.; this seemed to control it, but the medicine was disagreeable, and she discontinued it in consequence.

By her own desire she went into the country, and suspended the galvanism, but returned after a fortnight, the sickness having been excessive. The galvanism was then recommenced, and I ordered her a grain of sulphate of iron in an ounce of compound decoction of aloes, her bowels having become irregular and the power of defecation impaired. She again improved, but the sickness reappeared at the end of a fortnight, and the little appetite she had gained entirely failed. I then ordered her extract of *nux vomica*, extract of aloes, and extract of *hyoscyamus*, and for a time this seemed to give her some relief; but the improvement was very temporary, and she became irritable and again went into the country, and I did not see her for some months. She then told me that she had been to several other doctors, most of whom had told her that she was suffering from an affection of the spinal cord. One doctor, however, told her that all her trouble arose from anteversion of the uterus, and recommended her to use a pessary. She complained of a great increase of the dragging pain in the belly, and on examination I found the abdominal muscles much more wasted, particularly the *rectus abdominis*, which was more atrophic in some parts than others, and considerably more wasted on the left side than on the right.

I ordered a recommencement of the galvanic current, and it was applied vigorously night and morning for three weeks, during which time she appeared to improve very much. She was free from sickness, suffered less of the dragging pain in the belly, and less of the lancinating pains in the legs; but the lower dorsal and upper lumbar regions of the cord became so sensitive that she was only able to bear four cells of Stöhrer's battery. This sensitiveness, however, became less, and in a few days she was able to bear a very much more powerful current; but a few days later she became affected with ptosis of the left

eyelid. This lasted three or four days, and then disappeared, when she suffered from amblyopia, but it was temporary, and in a few days she was able to see more clearly again ; but from this time she grew worse, and the disease showed very markedly its characteristic progressiveness, and seemed to defy every attempt made to check it. About this time I was absent from town for a few weeks, and my friend Dr. Lockhart Clarke took charge of the patient for me, and was much interested in the singular features of the case, and he took Dr. Duchenne, who happened to be in London, to see the lady. Dr. Duchenne, in recognising the locomotor ataxy, was much struck with the singular symptoms with which it was complicated, particularly the sickness.¹ Shortly after my return to town, Dr. Hughings Jackson saw the case with me. The patient at this time had taken to her bed almost permanently. She, however, got up, and endeavoured with assistance to walk across the room, in order that Dr. Jackson might see her movements. But her feet and legs dangled in the air when she lifted them from the ground, and swung without control whenever she moved them forward. When the foot touched the ground she was not conscious of the fact until the weight of the body was thrown on the limb. Standing without support was absolutely impossible. She had

¹ Dr. Lockhart Clarke, in a valuable paper in the 'St. George's Hospital Reports' for 1866, records a case in which vomiting occurred, and he mentioned that "Duchenne, in 1861, had never met with vomiting at an early period of locomotor ataxy, and he therefore seems to consider this symptom sufficient to distinguish this disease from apoplexy or tumours of the cerebellum." Dr. Clarke says further, "that vomiting in locomotor ataxy is rare, I allow ; but in the first case of this disease that I ever saw, it happened to be one of the most prominent and persistent affections. The patient was a well-known musical composer, about forty years of age, and of strumous diathesis. The unsteadiness of gait was for a long time preceded by 'rheumatic pains' in all the extremities, by paralysis of both the third cerebral nerves, and by severe vomiting of bile and acid. The vomiting recurred about every four or five weeks in paroxysms, which lasted several hours and were attended with the most severe burning pains round the præcordia. The muscular incoördination which followed was at first limited to the lower extremities, but gradually extended to the upper, so that he was no longer able to write down the notes of his compositions. It partook very much of the spasmodic or jerking character ; and at a later period, when he attempted to walk with the assistance of a companion, his legs were spasmodically thrown about in the most disorderly manner conceivable. At length he was unable to stand, or even sit up in his chair ; and after a week's confinement to bed he quietly sank, with a deep slough on the sacrum, but without any cerebral disturbance."

now lost the sensibility of touch in the mouth, and the sense of taste to such a degree that she could only appreciate the presence of strong bitters and hot fluids when taken into the mouth. She complained very much of the constant flow of saliva, the quantity of which was enormous, and it was the cause of very great distress to her. She used frequently to wash out her mouth with astringents, in the hope of checking it, but to very little purpose. She was recommended by one of her friends to wash out her mouth with chiretta, and she thought that it gave her a little comfort, but it is doubtful if it had any effect beyond exciting slightly the nerve of taste. She also thought that washing out the mouth with port wine gave her ease, but I doubt this also. She rarely swallowed any wine or other alcoholic stimulant, and always declared that alcohol increased her abdominal pain.

At night time, as indeed often in the daytime, she was unconscious where her legs were in the bed, and she was unable to sleep except when lying upon her belly. I then observed that the pains in the limbs were fitful, appearing frequently, but irregularly, though usually at night time, and then lasting for some hours. Sometimes they were complicated with cramp, and I many times saw the gastrocnemii tensely contracted, the patient being in extreme pain. At this time she occasionally suffered from temporary ptosis; but the most distressing symptom was the agonising pain in the abdomen, which now was more or less constant, and was increased the moment she took food. Her friends used to try, from time to time, to tempt her with solids, and occasionally she took them, but if they were not immediately vomited they increased the abdominal pain, and at length the only food she was able to take was milk. This she took flavoured with cocoa, but it was more often vomited than retained. I thought that the increased pain was, in some measure, due to the weight of the abdominal contents dragging on the spinal column, the abdominal walls having become so wasted as entirely to have lost the power of support. As she herself expressed it, the abdominal contents were a dead weight, which fell over from one side of the cavity to the other as she turned from right to left or from left to right. The seventh nerve, both the portio dura and the portio mollis, became affected about this time, but the latter recovered its power, and

her hearing became, as formerly, very acute; the muscles of expression, however, never recovered. She then became amaurotic, but this was temporary. She also had some diplopia, and afterwards strabismus, but they were not permanent. She became at times very irritable, and would not see any one, and it was necessary to give up the galvanism, for although it sometimes relieved her pain, she was so weak that the application of it became irksome.

About three months before her death, whilst sitting one evening in a chair, to which she had been moved whilst her bed was being made, she shrieked suddenly and became unconscious. On regaining consciousness she told her friends that she thought she was dying. Her pulse, however, continued good, and I was of opinion that she would rally. She told her friends that she could never lie down or go to sleep again, and that she was perfectly free from pain. I found her next day still sitting in the chair. Her feet had begun to swell, but she would not allow herself to be moved. She was still free from pain, and had taken some milk without pain or sickness, but she had passed no urine for twelve hours. During the night she had had two more slight epileptic attacks. The day following she still refused to allow herself to be moved. She had passed no water, and her feet and legs were enormously swelled and œdematous, and she refused to see any one except her husband, her sister, and her nurse. She would not even see her child, but declared that she only wanted to die. The next day she sent a message to say she wanted to see me. She had allowed herself to be lifted upon her bed, and she said that all her old pains had gone, but that she had pain from retention of urine. Her bladder was distended, and it was necessary to relieve it with a catheter. For three or four days her bladder was only emptied by means of a catheter, and the urine was ammoniacal. It, however, became healthy again in a few days, and all the œdema of her legs disappeared. From first to last the urine never contained a trace of albumen.

When she sent for me she said she had something to say to me, and when I saw her she told me that she had seen a vision, that "an angel had come to her and told her that she was going to heaven." I asked her to explain, and she said that "she saw a bright light on the wall, and in it the smiling face

of the angel." From that time and during the following month she had numerous epileptiform seizures, which I found were somewhat checked with the large doses of iodide and bromide of potassium which I prescribed. I also ordered some aconite, as the abdominal and spinal pain had returned with renewed violence. The sickness soon returned, and, to add to her distress, the bases of both lungs became pneumonic. The pneumonia was, no doubt, hypostatic, and it disappeared in about a week.

The paralysis of the mouth, lips, tongue and pharynx increased to such a degree that most of her food (she now lived entirely on milk) was spilt in attempts to take it. She insisted on being lifted up, and on taking a cup of milk in her own hand and raising it to her mouth herself; but she seldom succeeded in swallowing much, for by far the largest quantity ran out at the angles of her mouth. One day her friends told me that she was out of her mind, and that she had been talking incoherently for some hours. When I went to her room, she asked me if I did not think her mother was an ugly old woman; she was incongruously merry, constantly laughing without apparent cause, and making frequent attempts to get out of bed "to put her mother's cap straight." She fell two or three times in these attempts, and was only restrained from hurting herself with difficulty, for she could move her head and shoulders sufficiently to allow her to slip down by the side of the bed. This excitement lasted some days, and she became more rational, but daily told me that she had again seen the vision of an angel. I had suspended the iodide and bromide of potassium, at her own request, some days before the maniacal symptoms appeared. But the epileptic attacks returned, and the drugs were resumed. She took such a dislike, however, to the medicine that I ordered her inhalations of nitrite of amyl instead. These gave her great comfort, they relieved the epilepsy, and also the intense pain in her back and limbs, and she improved for several days. The drug soon began to lose its power, and I substituted for it external applications of bisulphuret of carbon to the spine; the benefit of this was only slight, and I ordered inhalations of ether instead. These relieved her pain, but the sickness constantly returned. Often for five or six hours after taking milk she would be in pain, and then vomit the whole of it, coagulated, but undigested. She would sometimes take a

little milk every hour, at other times she could not be induced to take anything for twenty-four hours. The ether began to lose its efficacy, and I substituted chloroform for it, and it afforded her great relief. So great was the relief from the chloroform that she soon began to ask for it very frequently, and the quantity she took in a day often reached six ounces. It was rarely administered in a full dose, except when she was sleepless at night time; an inhalation sufficient to place her completely under the influence then often afforded her several hours' rest and several hours of comfort upon waking. Her friends, however, were very much afraid of administering full doses, and, as a rule, she only had sufficient at each inhalation to ease her pain. But she would ask for more the moment she began to feel uneasy. Her mental condition varied; at times she was rational, at other times noisy. During the last six weeks of her life the variation in her vital functions was very considerable; three or four times her lungs became oedematous and solid, and then became clear again. Her urine, too, became ammoniacal two or three times, and then again natural. On several occasions her bladder had to be emptied with a catheter, but towards the close of her life her urine and fæces were constantly passed involuntarily and unconsciously. Twice she got small bed-sores, but they were dressed and speedily healed. At length, after two or three slight epileptic seizures, she became lethargic, and the oedema of the lungs returned.

She had suffered but little pain for some days before she died, and consequently had not required chloroform on the morning of her death. She took a few spoonfuls of milk, after which she dozed and fell asleep. She gradually became comatose, and so died.

A few days before her death she requested her husband not to allow a post-mortem examination, and in consequence it was refused.

I was of opinion, and Dr. Clarke was of opinion with me, that the emaciation, sickness,¹ and general involvement of the chylo-

¹ I might mention that I have seen another case very similar in all its details, particularly as regards the sickness. The patient, also a lady, became subject to attacks of vomiting during pregnancy, and at the same time her ataxic symptoms appeared. The sickness persisted after her delivery, and recurred at intervals of about a fortnight, usually continuing for a fortnight at a time. The locomotor

poietic viscera in the case were due to some pathological state of the sympathetic, probably to some change in the semilunar ganglia, and this opinion gains force when it is remembered that Dr. Clarke has found in some cases a great pigmentation of the sympathetic ganglia; and his observations have been fully confirmed by those of MM. Henri Bonnet and Poincaré who described the changes they found in the sympathetic in cases of progressive paralysis with insanity, or as they call it "general paralysis of the insane" in the '*Annales Médico-Psychologiques*' for 1867-8.

There is, I think, but little doubt that in all forms of progressive paralysis, the sympathetic has a considerable share in the production of the changes, through its influence over the vessels, and, I incline to think, we shall yet find a link in the chain of causes of central nervous diseases, in the vaso-motor nerves, and the sympathetic ganglia. It was a matter of great regret to me that I was not allowed to examine the sympathetic in the case I have related.

A special feature in the case, and one which, I think, was highly interesting, was the mania, and I regard it as important in its bearing upon the classification of the nervous diseases which are characterised by progressive paralysis. The progressive character of many nervous diseases forms a link by which they may be connected together. At all events, those nervous diseases which are marked by some form of incomplete paralysis may be grouped together with advantage; firstly, on account of their progressive character, and, secondly, because they depend upon changes in the spinal chord and brain, which either run one into the other, or are closely allied—thus atrophy and sclerosis are closely allied, and other changes which I shall point out, are stages of these.

The ground upon which any classification of nervous diseases is based should be purely structural. The characteristic of progressiveness is a genuine feature which will isolate a class—but the clinical phenomena which we commonly see are too variable to partake of the value of constants in the considera-

stary was slowly progressive, and the movements of her legs were highly characteristic. She suffered lancinating pains in the lower limbs, and the muscles had partially lost their power of contracting under galvanic stimulus. Progressive locomotor ataxy is said to be uncommon in women, but some of the most characteristic cases I have seen have occurred in females.

tion, and when mental symptoms are considered with the rest, a structural basis as a ground of classification, is, from the nature of the case, necessary; for mind, so far as it is studied for the purposes of practical medicine, can only be regarded in its relation to organization.

I do not propose here to enter the field of controversy with the Berkleyan philosophers, and disprove that matter is a manifestation of mind, and I admit that the Berkleyan proposition has never been satisfactorily refuted; but for the practical consideration of mental states as modified by disease I must maintain that mind is a physiological phenomenon of the material brain. The perfection of the manifestation depends, firstly, upon quality; and secondly, upon quantity.

Firstly. An unhealthy brain is incapable of the healthy physiological phenomena of mind; consequently, we get dementia, varying in degree according to the brain changes, and exhibiting some peculiar symptom, such as mania, melancholia, or passive dementia.

Secondly. We find that however healthy the brain material may be, if the quantity is insufficient, perfect mental phenomena will be impossible—we then get amentia in some degree, which may range from absolute idiocy to the deficiency of some single faculty, as illustrated in a deficient or weak intellect, or in a want of moral sense, or by moral obliquity, or the condition called wrong-headedness. In some cases this may amount to little more than oddness or eccentricity; but, however intellectual a person may otherwise be, if he cannot recognise the incongruity of ridiculous acts, he must certainly, in some degree, be mentally deficient.

There is, still, in some minds, an open question as to the nosological position of some progressive nervous diseases, and notably in regard to progressive locomotor ataxy, and a form of progressive paralysis which has been miscalled "General Paralysis of the Insane."

Some have seized upon the so-called "General Paralysis of the Insane" and grouped it with mental diseases, forgetting, apparently, that insanity or mental disease is but symptomatic of brain disease, and that the mental symptoms of the neurosis, to which they have given a specific name, are not different from the ordinary mental symptoms of brain disease (dementia), viz.

mania, melancholia, or passive dementia. But another reason why it may be maintained that no such disease as "General Paralysis of the Insane" exists, is that the neurosis which has received the name, often appears without any mental symptoms whatever.

Then again, some clinical observers have objected to the expression "paralysis" as applied to locomotor ataxy. Its prominent clinical feature, however, is an increasing loss of power, and, therefore, clinically as well as pathologically it is entitled to rank as a "progressive incomplete paralysis." But the strangest complication of all has been the mixing together of "progressive locomotor ataxy" and the so-called "general paralysis of the insane." Westphal, for instance, describes the latter as having an ataxic gait, and presenting sclerosis of the spinal cord. As regards the ataxic gait it is true that many of the cases of progressive paralysis found in asylums exhibit it, but this does not render their disease progressive locomotor ataxy, and though many cases of progressive locomotor ataxy exhibit mental symptoms, the fact does not identify the neurosis with the form of progressive paralysis commonly found in asylums.

The two neuroses, however, both belong to one class, and that class is characterised by the special feature of a progressive though incomplete paralysis.

In all progressive paralyzes the disease usually begins in the cord, and extends gradually, giving rise in its progress to more or less impairment of motion, and, if it involves the brain, to mental symptoms; these of course depend upon, and vary with, the degree of cerebral involvement. It is urged that in progressive locomotor ataxy there is no loss of muscular power, but this is not universally the case. In the case I have related there was considerable loss of power as well as loss of control; whilst in the so-called "general paralysis of the insane" the loss of muscular power is much more apparent than real; the chief loss being that of the power of control. A third feature or an epiphenomenon of progressive incomplete paralysis, when the brain is involved, is epilepsy.

Besides the forms of progressive incomplete paralysis I have mentioned, are a number of others, all of which should be included under the class, and the essential pathology of each of

which I will briefly note. It will however be best to enumerate, in the first instance, the common forms of change in nervous tissue upon which the various progressive incomplete paralyses depend.

The first form of change is atrophy or simple wasting. In the cord this change is most perfectly seen in the white tissue, the bundles of fibres of which it is formed shrink, leaving spaces which become filled with fluid, probably simple œdema; the white matter of Schwann in a great degree disappears, and the axis cylinders often disappear altogether, the perivascular canals widen and the contained vessels become tortuous in the brain when it is affected. It is not unusual to see the lining sheath of the perivascular canal separated from the brain tissue and much thickened, and within and upon it granules of hæmotosin are often apparent.

In the grey matter of the cord some, but not all, of the cells undergo change. Some of them become filled with fluid, some become filled with granular matter, others remain more or less intact. In the atrophic brain similar changes occur in the cells, but the cell metamorphosis is usually more extensive when it occurs in the brain than it is in the cord. Softened spots are sometimes found in atrophied nerve tissues, but such spots are probably due to œdema.

The second important change in nerve tissue is sclerosis. Sclerosis is a pathological condition of nervous tissue which affects the white substance principally—it occurs in either brain or cord, sometimes affecting single structures as the posterior columns or the cuneiform columns—sometimes occurring in circumscribed spots and sometimes involving the structures generally.

Sclerosis represents, in nervous tissues, the condition of cirrhosis of other viscera, and several conditions of it may be observed. In the earlier stages areolar tissue is formed around the nerve tubes, which, in contracting, drags open or dilates the tubes. A section of cord or brain then presents widened or dilated tubes. The white matter of Schwann appears to be increased as the tube is full, and the axis cylinder remains intact. The future of sclerosis is variable; sometimes it changes but little after the first stage is accomplished; at other times the tubes and axis cylinders disappear, and the areolar tissue con-

tracts. This is the common result in progressive locomotor ataxy. Another, but more rare, form of change is granular degeneration; in this the sclerosed tissue breaks down into little masses of granular matter, and it is one of the most remarkable of all nerve-tissue metamorphoses. In all these the vessels undergo metamorphosis—sometimes fatty degeneration and dilatation, or disintegration. A third form of change, affecting both grey and white matter, is one which may be seen following the course of the blood vessels, which themselves eventually disintegrate. In the progress of the change, the investing sheath of the nerve fibres disappears, and the white matter of Schwann runs together. This undergoes change, and, under the microscope, appears as oily globules, probably myelin, which dissolve the continuity of the tissue. The vessels first become blocked, the blood in them then undergoes change, and finally the vessels and its contents break up and disappear. A fourth form of change in nerve tissue occurs principally in the grey matter, the cells of which undergo metamorphosis. In the first state the cells lose their nuclei and nucleoli, and become filled with granular matter. In the second state the cells lose their sharp outlines and their caudate prolongations. Sometimes this granular matter increases greatly in quantity, and occasionally to such a degree that the investing sheath of the vesicle disappears, and the granules may be seen in a mass in the field of the microscope. In the third state the cells attenuate, and though both sheaths and prolongations remain, they can only be seen when viewed with high powers, and sometimes require an oblique light. These conditions are sometimes more or less mixed.

The various progressive paralyses which I may enumerate as dependent upon the changes described are—

1. A progressive incomplete paralysis, usually attended with glosso-labial paralysis, hitherto called or miscalled "General Paralysis of the Insane," though it is common enough to see the bodily paralysis without any mental symptoms. The paralysis is due to atrophy of the cord, and the mental symptoms to atrophy of the brain. The neurosis might be called paralysis from spinal atrophy, or when both cord and brain are involved it might be termed paralysis from spinal and cerebral atrophy.

2. Senile trembling, an unimportant form of paralysis agitans,

dependent upon atrophy, and sometimes associated with dementia.

3. A form of progressive incomplete paralysis, associated with tremulous movements of the limbs, and which has been called "Sclerosis," but the term is hardly applicable as specifically used, and is very liable to be confounded with the same word used in its generic sense. A better clinical name for the affection is "Scleriasis." In this affection the sclerosis occurs in circumscribed patches, in both brain and cord, and the walls of the vessels in the neighbourhood of these patches show particles of granular matter. The cells are not usually much affected, but sometimes the extreme change or granular disintegration of the sclerosed tissue occurs. Mental symptoms occur when the brain is involved.

4. Paralysis agitans, a necrosis of middle age, characterised by trembling of the extremities, particularly the upper. A curious gait in walking, as though the patient balanced himself on the balls of the great toes, and an anxious expression, with prominence of the eyeball.

This condition is dependent upon sclerosis of the cord extending to the *pons Varolii*, the cells of the grey matter undergo granular change, and the granular matter becomes very great in quantity—the cell walls disappear, and the heap of granules falls to pieces, so that the particles are seen in little patches or groups on the field of the microscope.

5. Duchenne's paralysis or pseudo-hypertrophy of muscles. I am indebted to Dr. Lockhart Clarke for these particulars. He most kindly allowed me to examine his specimens of cord from a case of this form of paralysis, and furnished me with the following note of changes:

- a. Disintegration chiefly of the grey substance.
- b. Disintegration of both anterior and posterior roots of the spinal nerves.
- c. More or less disintegration of the anterior commissure.
- d. Scleroses of white substance, particularly of the posterior and lateral columns.

To this, I may add, that the special form of disintegration which I observed in Dr. Clarke's sections, was that in which the change progresses along the course of the vessels, which eventually disappear; the sheaths of the tubes of the white

tissue in the immediate neighbourhood of these vessels disappearing, and the white matter running together, and appearing as oily globules (probably myelin) mixed with fibres aggregated like seaweed.

6. Progressive locomotor ataxy, a loss of coördination in muscular movement and other symptoms of incomplete paralysis, bodily, and sometimes mental. The symptoms are due to sclerosis, usually commencing in the posterior columns of the cord, and often confined to that structure, but occasionally involving other portions of the cord, and also of the brain. In this particular form of progressive incomplete paralysis, the sclerosed tissue often becomes atrophic; in extreme cases the white matter of Schwann disappears, and the altered structures, particularly when the posterior columns are greatly changed, appear as little else than bundles of areolar tissue—this is the stage of sclerosis to which the term “grey degeneration” has been applied.

7. Progressive muscular atrophy may affect any muscles, and the wasting is sometimes very acute; it is dependent upon changes in the cord, as I pointed out in a paper with drawings in the ‘*Pathological Transactions*’ for 1873; and as Dr. Clarke has also pointed out in several papers on the subject.* Among the principal changes which I have observed, are, a disintegration of the white substance, sometimes an irregular sclerosis, and a granular condition of the stroma of the grey matter. The most characteristic change, however, which I have found, is in the cells, and it consists in their attenuation. To such a degree are they sometimes attenuated that they are only discoverable with a high power, and even then may not be easily recognised, except with an oblique light. I have specimens in which these attenuated cells, nevertheless, exhibit their sharp outlines perfectly, and from which the caudal prolongations, also attenuated, may be traced for a long distance. Another change, which is highly characteristic, is an enormous dilatation of the vessels. So striking is this change, that it cannot fail to attract attention upon the first glance at the specimen. The change is a progressive one; a small piece or the whole of the cord may be affected, and there is no reason why the change should not extend to the brain.

¹ See ‘*Medico-Chirurgical Transactions*,’ vol. lvi, 1873.

8. Glosso-laryngeal or glosso-pharyngeal paralysis is a neurosis which belongs to the same class, but I have only seen it clinically, and cannot state, from examination of tissue, the exact form assumed by the change in the nerve-centres; when, however, the close anatomical relation of the nuclei of the hypoglossal, and glosso-pharyngeal nerves is regarded, it is easy to conceive how minute a spot of change in these centres may cause the symptoms; but whether that change be atrophy, sclerosis, or the disintegration similar to that found in Duchenne's paralysis, or changes similar to those of muscular atrophy, or some other unrecorded change, it is impossible to divine. The disease is rare, and specimens of tissue are often difficult to procure; but time, I hope, will furnish materials for examination, when the exact conditions may be recorded, and the changes which produce the affection definitely determined.

ON IRITIS.

By C. HIGGENS.

IN this paper iritis has been considered under seven heads, viz.—I. Causes; II. Morbid changes; III. Complications; IV. Symptoms and diagnosis; V. Varieties; VI. Results; VII. Treatment. No very lengthy description has been entered into, but an attempt has been made to point out clearly the more prominent diagnostic signs, and to lay down a simple and rational plan of treatment.

I. CAUSES.

1. Local.—(a) *Mechanical*.—Foreign bodies remaining for a long while in the conjunctival sac or cornea and setting up inflammation, constant irritation of the cornea from inverted lashes or granular lids, injury to the iris itself by accidents, operations, foreign bodies in the anterior chamber, pressure by a swollen crystalline lens, exposure of the iris from perforation of the cornea.

(b) *Chemical*.—Caustic substances, lime, &c., and the improper use of irritating applications in cases of ophthalmia, &c.

(c) Draughts of cold air or rapid changes of temperature in persons prone to acute inflammations of fibrous tissues.

2. Iritis is not unfrequently secondary to inflammations of other parts of the eyeball (cornea or choroid), or may be caused by sympathy with the other eye.

3. Constitutional.

(a) Debility after acute diseases, or consequent on over-lactation, &c.

(b) Certain specific diseases, syphilis, rheumatism, or gout.

II. MORBID CHANGES.

In all cases of iritis there is hyperæmia, with a tendency to the formation of new products either as infiltration into the substance of the iris, causing swelling, cloudiness, and discoloration, or as distinct excrescences, visible to the naked eye, which have a strong inclination to form adhesions between the iris and neighbouring parts, or to stretch across and close the pupil. These excrescences vary in size and shape; some appear as whitish threads, uniting the iris to the lens capsule, others as more or less dense membranes filling and closing the pupil; others, again, appear as yellowish nodular projections, varying in size and number at the pupillary margin or on the surface of the iris. These last occur in syphilitic iritis, and resemble in structure syphilitic gummata in other parts.

Granulations are occasionally beautifully seen on the inflamed iris, especially if there be perforation of the cornea. These new products are generally more or less mingled with the pigment of the iris. In some cases of iritis there is a tendency to the production of pus, or for the new products rapidly to run into suppuration, forming abscesses in the texture of the iris, and collections of pus in the anterior chamber (*hypopion*).

III. COMPLICATIONS.

Iritis is not unfrequently accompanied by inflammation of other parts of the eye.

(a) Of the ciliary body (*irido-cyclitis*).

(b) Of the choroid (*irido-choroiditis*).

(c) Of the cornea (*kerato-iritis*).

(d) Iritis is also a prominent symptom in panophthalmitis.

IV. SYMPTOMS AND DIAGNOSIS.

Certain symptoms are met with in most cases of iritis, and may be described as constant; others only occasionally.

The *constant* symptoms are:—Hyperæmia (not easily recognised), change of colour, cloudiness, loss of polish and swelling of the iris; sluggishness or immobility, with, as a rule, contraction of the pupil, injection of the ciliary region (ciliary redness), watering of the eye, and impairment of vision.

The *occasional* symptoms are—pain, intolerance of light, new growths, visible to the naked eye, differing in their characters; production of pus, and irregularity in the outline of the pupil.

Hyperæmia is probably present at the very commencement of all cases of iritis, but, unless very extreme, it is not easily recognised. Occasionally one or two large vessels plainly visible to the naked eye are met with on the surface of the iris. Sometimes, but very rarely, there is spontaneous hæmorrhage into its substance, or collections of blood in the anterior chamber.

The change of colour, cloudiness, loss of polish, and swelling, are due to the formation of new products in the substance of the iris and upon its surface. It will be found on careful examination and comparison of the two eyes that the radiated markings so plainly seen in healthy, especially *light* irides, and due to the arrangement of the blood-vessels, have become obliterated; the whole iris has a dull, velvety appearance, and there is loss of the bright polish seen in the healthy condition. The colour will also be found changed; blue and grey irides will appear of a dirty slate colour or yellowish-green; dark irides, ochre or rust colour. The distinctness of all these changes varies much with the severity of the inflammation and the time it has existed; in some cases they are so well marked as to be seen at a glance, in others close and careful examination is required in order to make them out. It is rare that both irides are similarly affected, so that certainty in diagnosis can generally be arrived at by careful comparison of the two.

The sluggishness or immobility of the pupil is also referable to the proliferation of tissue. Inflammation can hardly occur without the mobility of the iris being more or less affected. If the muscular fibres themselves are in a normal condition the

existence of new material in the connective tissue of the iris, by which they are surrounded, and the enlargement of the blood-vessels, must considerably impede their action. This condition of the pupil is therefore inseparable from iritis; it is one of the most valuable diagnostic signs, and whenever it exists in any inflammation of the eye must always be looked upon as an indication for treatment. In examining the condition of the pupil great care must be taken to guard against deception. The patient should be placed facing a good light, and the sound eye carefully covered, so as to prevent all possibility of light entering it; the surgeon should stand so that he can obtain a good view of the pupil of the affected eye, and alternately cover and uncover it with his hand, carefully watching the pupil as the light is allowed to fall on the eye; if after careful examination there is any doubt as to the condition of the pupil, the instillation of a few drops of solution of atropine will clear it up by causing irregular dilatation, some portions of the iris alone being inflamed, others retaining their normal condition and contractile power. It is of the greatest importance to recognise the earliest symptoms of iritis, as it is at the commencement of an attack that well-directed treatment is capable of preventing those disastrous complications which will be described under the results of iritis. Many cases of closed pupil, extensive synechiæ, &c., might have been prevented by the timely use of a few drops of solution of atropine.

Contraction of the pupil is caused by hyperæmia and inflammatory deposits in the iris, by which it is not only increased in thickness, but also in width. When the increase in thickness is well marked, which is not very common, the iris appears to occupy more of the anterior chamber than in the healthy condition; the increase in width becomes very evident from the marked decrease in the pupillary area. The amount of contraction is variable, and occasionally the pupil may be somewhat dilated, but a pupil considerably below the normal size is the rule in iritis. This contraction is sometimes described as being caused by spasmodic action of the sphincter muscle, but as it frequently does not occur in the very first stage of inflammation (*i. e.* hyperæmia), only becoming evident when inflammatory products have been thrown out in such quantity as to preclude the possibility of muscular action, it appears much more reason-

able to suppose that this condition is a part of the enlargement of the iris and due to its increased width. In determining the amount of contraction of the pupil it is only necessary to compare the two eyes.

Injection of the Ciliary region is caused by hyperæmia of the branches of the anterior ciliary arteries situated in the episcleral tissue, in that part of the eyeball immediately surrounding the cornea known as the ciliary region. This is perhaps the earliest as well as the most constant of all the symptoms of iritis; it is seen as a more or less defined zone of vascularity, situated immediately outside the margin of the cornea. The colour and width of the zone vary from a narrow, often broken, ring of light rose colour (perhaps only noticed on careful examination) immediately around the corneal margin, to a broad band of a deep red, extending some distance over the surface of the sclerotic. In some severe cases the band of ciliary redness is found to be raised above the surface of the surrounding parts, and evidently swollen, showing that there is infiltration into the episcleral tissue.

The depth of colour is looked upon by some as diagnostic of the particular form of iritis; for instance, if the colour be very deep the iritis is looked upon as of syphilitic origin; if the shade be light, rheumatic or some other form of inflammation is to be suspected. Too much attention should, however, not be paid to the difference in shade, as the variations described are certainly not met with in practice in connection with special forms of iritis. Ciliary injection is often accompanied and masked by much increased vascularity of the conjunctiva, but certainty in diagnosis may be arrived at by noticing the position of the vessels, as also their size and colour. In inflammation of the conjunctiva the vascularity is greatest about the equator of the eyeball and in the fornix, and diminishes *towards* the cornea; a network of large vessels of a bright red, almost scarlet colour, is seen in the inflamed conjunctiva, and by gentle pressure may be made to glide over the surface of the eyeball. Ciliary injection shows through the vascular conjunctiva; it exists only around the *margin* of the cornea, and its colour becomes deeper and more marked the nearer it approaches this; there are no separate vessels as in the inflamed conjunctiva, neither can the zone of redness be made to alter its position.

A white ring sometimes met with between the corneal margin and ciliary zone is looked upon by some as diagnostic of rheumatic iritis. Ciliary injection, although a constant and early symptom of iritis, is not peculiar to it, but is also met with in most forms of keratitis, choroiditis, cyclitis, and in inflammation of the episcleral tissue itself (episcleritis); in this latter disease, which is but seldom seen, the increased vascularity does not take the zonular form, but is found as a deep red patch near some part of the corneal margin.

Watering of the eye is met with in most inflammations of any of its structures; it is a symptom of no particular diagnostic value in iritis, but is dependent upon the general conditions of hyperæmia and irritation.

Impairment of vision is a very constant symptom of iritis; in most cases it is not one of the earliest noticed, but occasionally an attack comes on so insidiously that the patient receives the first intimation of something being wrong from finding that the sight of one or both eyes has failed to a considerable extent. Impairment of vision results from paralysis of the ciliary muscle and iris, caused by the deposition of inflammatory products in their texture, also from opacities of the lens capsule, and more or less occlusion of the pupil by a new material.

Occasional symptoms.—Pain is the most variable of all these; in many cases it is entirely absent, in some only slight, in others most severe, not only in the eyeball itself, but in other parts supplied by the first division of the fifth nerve, viz. the side of the nose and forehead; occasionally also severe headache occurs, more especially on the side of the affected eye, with much constitutional disturbance. The pain is of a dull, aching, or throbbing character, often intermittent or aggravated at times, more especially at night; the eyeball is extremely tender, and the pain is much increased by pressure.

Intolerance of light (photophobia) is met with occasionally. When it exists, some inflammation or ulceration of the cornea should always be suspected and carefully looked for. Photophobia is a very constant symptom of the peculiar form of keratitis, sometimes accompanied by iritis, occurring in persons the subjects of congenital syphilis.

New growths and formation of pus.—The new growths met with in iritis, as well as the occurrence of suppuration, have

been mentioned under morbid changes, but require a somewhat fuller description. Some of the new growths are so small as to be with difficulty recognised by the unaided eye; moreover, they are so mixed up with pigment as to become quite dark, and scarcely distinguishable from the black pupil; they are, however, plainly visible by the assistance of oblique illumination, and as they become larger are easily seen by the unaided eye. These growths are light or dark brown or nearly black in colour, bordering a varying amount of the pupillary margin, or even surrounding the whole pupil; their inner border is destitute of pigment, and appears of a greyish-white colour; they adhere more or less firmly to the lens capsule, and as the iritis subsides may become drawn out into threads or thin bands. In some cases the pupil is quite occluded, its whole margin being firmly fixed to the lens capsule, and its area filled by pigment patches interspersed with yellowish-white streaks near its margin, its centre being occupied by a yellowish or greyish membrane containing but little pigment, the whole presenting somewhat a striated appearance.

Nodular excrescences.—These are often described as lymph-nodules; they are met with as yellowish-brown masses, having a somewhat warty appearance, about the size of a millet-seed, and project from the margin of the pupil or some part of the anterior surface of the iris. They also exist on its posterior surface, but in this position are not visible; they occur singly or several distinct growths are found in the same eye; at times they seem to run into each other, with no well-marked line of separation; occasionally they are met with presenting somewhat the appearance of fleshy condylomata.

Pus.—In iritis with suppuration the iris may appear covered by a thin layer of a yellowish colour. This soon separates, mixes with the aqueous humour, rendering it turbid, and at length settles down to the lowest part of the anterior chamber, forming an unmistakeable layer of pus (hypopion), varying in depth according to its amount. In other cases the purulent matter is seen as more or less circumscribed masses of a dirty yellow colour, scattered over the surface of the iris, or as one or more distinct abscesses in its structure; these conditions are also accompanied by hypopion, and are often associated with collections of pus in the cornea.

Irregularity of the pupil is caused either by partial inflammation of the iris, some parts retaining their normal condition and contractility, or by adhesions between the pupillary margin and the capsule of the lens.

V. VARIETIES OF IRITIS.

Inflammations of the iris have been very variously described, the classification of some authors being based on the course of the disease, as acute and chronic; of others, again, upon the supposed cause, as constitutional, syphilitic and rheumatic, traumatic and sympathetic. Another division has been made, based upon the nature of the products of the inflammation, as plastic, suppurative, and serous. Any form of iritis may be either acute or chronic in its course, and the inflammatory action once set up, whether dependent on syphilis, rheumatism, &c., injury or sympathy with the other eye, may lead to the formation of new growths or purulent deposits. In by far the greater number of cases no line can be drawn separating them into this or that variety, and the surgeon must content himself with the history of the case and the existence of any constitutional disease, and treat it accordingly.

Three varieties of iritis will be described here, and the prominent distinctive features met with in typical cases pointed out. 1. Simple iritis; 2. Rheumatic, or recurrent iritis; 3. Syphilitic iritis.

Simple Iritis.—This requires no very lengthy description. An uncomplicated case presents all or most of the symptoms described above as the more constant, and frequently is accompanied by more or less severe pain; it is not unfrequently met with in the course of ophthalmia, or from the irritation of foreign bodies, inverted lashes, or granular lids. Iritis should always be suspected if in any of the above diseases there is increase or alteration in the character of the existing pain. An attack may last one or two weeks, or longer; a few adhesions may form between the iris and lens capsule, but the inflammation usually ends in resolution, the iris quite recovering its normal condition. In this, as well as the other forms of iritis, however, the inflammation may run on to the

formation of a considerable quantity of new material, or into suppuration.

Rheumatic, or recurrent iritis.—A peculiar form of iritis associated with rheumatism or gout, or occurring in children of rheumatic or gouty parents, has received considerable attention from Mr. Hutchinson ('Ophthalmic Hospital Reports,' vol. vii, parts 3 and 4).

This peculiar form of inflammation attacks the conjunctiva, sclerotic, or episcleral tissue and cornea, as well as the iris. It is not unfrequently associated with gonorrhœa, and is a not uncommon accompaniment of that form of pyæmia known as gonorrhœal rheumatism. The disease has received various names from different authors, as catarrho-rheumatic ophthalmia, gonorrhœo-rheumatic ophthalmia, sclero-iritis, rheumatic or arthritic iritis, rheumatic scleratitis, &c.

Most of the names used point in some way or other to a rheumatic origin. Every practical surgeon must have noticed that in many cases of gonorrhœa the patients are affected by inflammation of the eyes, not genuine gonorrhœal ophthalmia, which is caused by direct contact of gonorrhœal matter (and is fortunately a comparatively rare disease), but simply some injection of the conjunctiva with muco-purulent discharge, and perhaps dimness of vision, accompanied by deep-seated vascularity, showing implication of some more important structures (cornea, iris, sclerotic, choroid, or episcleral tissue). It would appear that these attacks of inflammation in the eyes come on when the gonorrhœa has assumed somewhat of a constitutional form—that is, when some of the joints have become affected, giving rise to gonorrhœal rheumatism. Inflammation of the eyes is also met with in gout and in rheumatism not connected with gonorrhœal taint.

The subject of ophthalmia, &c., will not be entered into here, but the iritis will be described as nearly as possible in its typical form.

Rheumatic or recurrent iritis occurs in persons who are subject to attacks of rheumatism (gonorrhœal or simple) or gout, and also in the children of rheumatic or gouty patients. An attack of this form of inflammation presents all the constant symptoms of iritis, and has one character peculiar to it, viz. its recurrence, some patients having had as many as twenty

separate attacks. In some cases the attacks observe a remarkable periodicity, recurring regularly at the same time of year. The inflammation sometimes appears in one eye, sometimes in the other, or perhaps in both, rarely, however, simultaneously, but at short intervals, the second eye becoming affected long before the first has begun to recover. The iritis is frequently accompanied by more or less haziness of the cornea and also of the aqueous humour. In some cases very severe pain of a dull aching character is experienced in the eyeball, forehead, side of nose and temple; in others the attack is most insidious, the patient's attention not being attracted until a considerable quantity of new material has been thrown out, extensive adhesions formed, the sight of one eye much impaired, and the inflammatory action extended to the other. There is nothing peculiar in the character of the new material in recurrent iritis which will assist diagnosis. A considerable quantity of inflammatory matter of a greyish colour, and varying in density, is generally thrown out, forming extensive and firm adhesions between the iris and the lens capsule, and more or less occluding the pupil. The only well-marked characteristics of this form of iritis are its association with a rheumatic or gouty history, either hereditary or personal, and its liability to recur almost any number of times at longer or shorter intervals.

Syphilitic iritis.—Syphilis is, perhaps, the most common of all the causes of iritis. This, like the other forms of inflammation described, as a rule presents no particular characteristic symptoms by which it can be diagnosed with certainty. Differences in the colour of the ciliary zone, in the character and severity of the pain, &c., are described, but can seldom be recognised in practice. Great stress has been laid on the characters of the products of inflammation, and in a typical case these are peculiar, consisting of nodules, of varying size and number, on the surface of the iris or at the margin of the pupil, blocking it more or less, and occasionally filling its whole area. (The description of these nodules has been given under morbid products and new growths.) They are much altered by treatment, and in debilitated subjects are prone to degenerate into pus. In by far the greater number of cases, however, these peculiar nodular growths are absent, the discoloration and loss of polish of the iris, &c., being the only indication of the formation of products

of inflammation. An ordinary case of syphilitic iritis presents the constant symptoms of iritis in a well-marked degree, with, at times, severe pain, but in most cases this symptom is insignificant; occasionally, too, there is much intolerance of light. If the peculiar growths occur, their presence gives an almost certain indication that the iritis is of syphilitic origin, but in most cases certainty in diagnosis can only be arrived at by cutaneous eruptions, ulcers in the fauces, or other symptoms of syphilis, either coexistent with the attack of iritis, or a history of their having occurred at some previous time. Syphilitic iritis is most frequently met with between the ages of eighteen and forty, but is seen, as a manifestation of congenital syphilis, in infancy; it is uncommon at this age, and, as it presents no very marked symptoms, is frequently overlooked, its results only becoming apparent as age advances. Genuine syphilitic iritis in infants must not be confounded with the very much more common disease of children and young adults, the result of inherited syphilis, and known under the names of syphilitic keratitis, corneo-iritis, &c. This is primarily an affection of the cornea, the iris being implicated secondarily or not at all. An uncomplicated attack of syphilitic iritis lasts from six weeks to two or three months; one or both eyes may be affected, the inflammation frequently commencing in one, and the other becoming affected some few weeks later; relapses are not unfrequent; but an attack once fairly recovered from does not recur. Syphilitic iritis is not unfrequently complicated with cyclitis and choroiditis.

VI. RESULTS.

In many cases of iritis, especially if early and properly treated, perfect recovery takes place; in others permanent signs of inflammation are left. These may be divided into three classes:

1. Changes in the iris itself (atrophy, rigidity, rottenness, proneness to bleeding when touched).
2. Changes from the persistence of inflammatory products (the various forms of adhesions—synechiæ, capsular cataracts, and closed pupil).

8. Changes dependent on complications (more or less degeneration of the eyeball).

1. *Changes in the Iris itself.*

Atrophy of the iris occurs after long or very acute inflammation, its normal appearance is destroyed, the markings on its surface obliterated and their places occupied by tendinous striæ, distributed irregularly through its structure; the colour is altered, blue irides turning a dirty lead colour, dark ones dirty red or tan colour; the iris also is much thinned, the thinning becoming very evident on removal of a portion. Rigidity or rottenness accompanies the atrophy, and on performing iridectomy the iris will be found either firmly resistant and not easily torn away, or so soft that the forceps only bring away the small portion included between their blades. The proneness to bleed is also very marked, the anterior chamber often becoming full of blood immediately the iris is touched; this does not occur in performing iridectomy on a healthy eye unless the iris be torn away from its insertion, when pretty free hæmorrhage is sure to take place. In cases of atrophy the function of the iris is completely destroyed, the pupil being quite immovable, often occluded and the power of accommodation lost.

2. *Changes caused by persistence of inflammatory products.*

Adhesions of the iris to neighbouring parts (synechiæ) are distinguished as anterior where the iris is adherent to the posterior surface of the cornea, posterior when the iris is adherent to the lens capsule. Total posterior synechia signifies adhesion of the whole posterior surface of the iris to the lens capsule; partial posterior synechia adhesion of portions, generally a greater or less extent of the pupillary margin. Anterior synechiæ are not common as the results of uncomplicated iritis; they usually occur when the cornea has become implicated either by a perforating ulcer or by destruction of some portion by suppuration. When they do occur in uncomplicated iritis they are situated about the greater circumference of the iris, where in the normal condition it is nearest to the cornea; in this position swelling of the iris soon brings it in contact with the

cornea, to which it becomes adherent to a greater or less extent; this form of synechia is frequently overlooked. Posterior synechiæ are more common; as stated above, they may be total or partial. Total posterior synechia is not common; it is usually accompanied by considerable disorganisation of the iris. A nearly total posterior synechia is met with in which the iris appears bulged forwards at parts, drawn backwards at others, either in points or lines, producing somewhat the appearance of the seat of a stuffed chair, except that the drawn-in portions are not situated at regular intervals. This appearance is due to some parts of the iris being firmly adherent to the lens capsule, others free and pushed forwards by fluid behind; the pupil in these cases is excluded and sometimes entirely closed, so that no trace is left of its original position. If iridectomy be performed in a case of total posterior synechia, a clear black pupil is apparently obtained, but on subsequent examination with focal illumination it is found that only the fibrous portion of the iris has been torn away, the uvea being left attached to the lens capsule in an unbroken layer.

Partial posterior synechiæ are very common; they are usually met with as adhesions of some part of the pupillary margin to the lens capsule. The iris may be either firmly and closely united at different points, or the adhesions may be drawn out into thin bands or threads of a greyish-brown colour, which become much more evident after the instillation of atropine. In some cases the pupil is found to be excluded, the whole margin being firmly fixed to the lens capsule, its outline irregular and bordered by a brownish ring, merging into a greyish membrane towards the centre of the pupil. This form of adhesion becomes very evident on the removal of a portion of iris, the pupil being left intact and mapped out by a ring of brownish colour externally and greyish internally; the inner grey portion shading off gradually into the more or less transparent lens capsule. Irregularities of the pupillary margin, without adhesion to the lens capsule, are met with either as small projections, or thin bands, or threads free at one end and appearing as if they had once been adherent and become detached; these last soon shrink up and disappear entirely or remain as small whitish projections from the pupillary margin.

Opacities of the lens capsule are frequently met with, either

as spots or patches of a greyish colour or tinged with brown from admixture of pigment. Others, again, consist almost entirely of the brown uvea detached from the posterior surface of the iris. *Capsular cataract* is said to exist where a very dense iritic effusion has taken place, the new material not simply sticking to the lens capsule, but infiltrating the capsule and producing an opacity of considerable thickness, which may even implicate some of the superficial fibres of the lens itself. Capsular cataract is seen as a central white spot, with the capsule around clear or only slightly hazy, and the pupil freely moveable, or there may be a few posterior synechiæ. It may also exist with excluded or closed pupil, but then only appears as part of the general opacity. The same form of cataract is not unfrequently met with in the eyes of persons who have suffered from purulent ophthalmia in infancy. At this period of life the anterior chamber is extremely shallow, and the inflammation probably spreads through the cornea and involves the capsule, which is almost in contact with it. Closed pupil is not an uncommon result of iritis, the pupillary margin being drawn up to such an extent that hardly any vestige of the original pupil is left, or its area may be blocked with new material and the original outline be still distinguishable, sometimes retaining its circular form, but more commonly extremely irregular. In cases of closed pupils there are always more or less extensive posterior synechiæ.

The nodular growths noticed in syphilitic iritis are, as a rule, easily absorbed, leaving little or no trace of their previous existence. Occasionally they suppurate.

In *Hypopion* the pus generally becomes absorbed. The process of absorption does not go on progressively, but in a see-saw manner, the pus having almost disappeared one day, and the next considerably increased. In time, however, it is all removed except where the quantity is very large or the pus thick and flaky, in which case more or less dense material remains permanent at the lowest part of the anterior chamber.

3. *Changes dependent on complications.*

The most disastrous results of iritis occur in complicated cases, sometimes from suppuration commencing in the iris and extend-

ing to other structures of the eyeball, or commencing in other parts and implicating the iris secondarily. In either case the globe may become converted into an abscess and all sight be lost. This form of inflammation would be more properly described as panophthalmitis, but is mentioned here as iritis as one of its most prominent symptoms. Iritis complicated with choroiditis or cyclitis is not unfrequently met with, especially in syphilitic cases. Here the nutrition of the eyeball becomes impaired, changes take place in all the ocular structures; the globe, at first somewhat tense, subsequently becomes soft; vision is reduced to mere perception of light or entirely lost; and, after a time, the eyeball shrinks to a greater or less extent, frequently giving rise to severe pain.

VII. TREATMENT.

An attempt has been made above to point out the differences observed in the varieties of iritis described, and, as has been stated, occasionally cases are met with which may be diagnosed with certainty as belonging to this or that variety; but, as a rule, the diagnosis of iritis, without specifying any one particular variety, will be all that can be arrived at from the appearance of the affected eye. Slight differences in the various forms of iritis are interesting to the oculist, but are of little practical importance either to the surgeon or general practitioner. In any case of iritis treatment should be directed to the following five indications:—

1. To remove the cause, local or constitutional.
 2. To prevent mischief from inflammatory products.
 3. To obviate as much as possible the tendency to new formations.
 4. To allay pain where it exists.
 5. To remedy the conditions resulting from iritis.
1. All foreign bodies in whatever situation, whether upon the eyelids, in the conjunctival sac, upon or imbedded in the cornea, in the anterior chamber, iris itself, or any other part of the eyeball, must be removed as soon as possible. Foreign bodies in the conjunctival sac or on the surface of the cornea are easily removed, either with a brush, probe, corner of a pocket-handkerchief, &c.; foreign bodies imbedded in the cornea must be

removed with the point of a knife or small spud; they will frequently be found very firmly fixed, and by no means easily dislodged; foreign bodies in the anterior chamber must be removed by incision; if imbedded in the iris, that portion in which the foreign body is fixed will, in all probability, have to be removed with it. A foreign body penetrating the eyeball and leaving no part projecting externally is very difficult to remove, but the difficulty must not deter the surgeon from making the attempt, and he may rest assured that his manipulations will not do as much harm as the foreign substance will if left in the eyeball. Foreign bodies, as pieces of iron, thorns, &c., fixed in the eyeball and leaving some portion projecting externally, are easily removed with forceps. Chemical substances, as lime, must be carefully removed, and the conjunctiva thoroughly cleansed with fresh water. All inverted lashes must be carefully pulled out with the forceps, and granular lids or other affections of the conjunctiva must be treated. In cases of injury to the eyeball the lens frequently becomes opaque and swollen; this usually follows penetrating wounds of the cornea, either with or without the lodgment of a foreign substance, but occasionally results from concussion alone. This condition is a very fertile source of the most severe iritis, and such a lens must always be looked upon as a foreign body and removed by operation. If iritis be sympathetic and caused by irritation of a blind, painful eyeball, this must be excised. The constitutional causes of iritis must be treated on general medical principles; if dependent on rheumatism or gout these must be treated by colchicum, iodide of potassium, and alkalies, but more especially by strict attention to diet, and, if possible, by change of air. Patients who have suffered from repeated attacks of recurrent iritis in one locality have occasionally enjoyed partial or perfect immunity from the disease on change of residence; between the attacks measures should be taken to guard as much as possible against recurrences. If syphilis be the cause of the iritis, mercury must be given in some form or other, either by inunction, vapour baths, or by the mouth. Debility must be treated by tonics, of which none is better than the tincture of the perchloride of iron; good living, and good air; if brought on by over-lactation, suckling should be discontinued immediately.

2. To guard as much as possible against mischief from inflammatory products, the pupil must be dilated and kept in that condition. In an early stage this is easy enough; but if the iritis has existed any time, it is almost impossible to make much impression upon the pupil until the inflammation has begun to subside.

As long as the pupil can be kept well dilated there is little fear of any extensive adhesions taking place, or of its area becoming blocked by inflammatory products. Sulphate of atropia is the agent most commonly used to dilate the pupil, in solutions of varying strength, or in the form of atropia gelatine, which consists of thin sheets of gelatine imbued with sulphate of atropia and marked into squares. Belladonna may also be used for the same purpose, but is less certain in its action than atropia. In every case of iritis the surgeon should place a few drops of a solution of sulphate of atropia, two or four grains to the ounce of water, on the conjunctiva of the lower lid, at the time of his visit, and should, if possible, see the patient again in the course of twenty minutes or half an hour; if the iritis be in an incipient form, some dilatation of the pupil will have taken place; but not if the inflammation has lasted for any length of time. In any case a solution of one grain of sulphate of atropia to an ounce of water should be prescribed for the patient to use himself from three to six or eight times a day, or a weaker solution, one eighth or one fourth of a grain to the ounce of water, may be ordered to be used every hour or half-hour, or even oftener throughout the day. Among the working classes, who are engaged all day, and have not much time to attend to their eyes, it is well to order the atropine to be used in the evening only, three to four or six times in the hour or two before going to bed. In every case the condition of the pupil must be carefully noted at each visit, and more of the strong solution applied whether dilatation has taken place or not. Belladonna is best employed as a lotion, containing from six to ten grains of the extract to an ounce of water, with which the eye should be frequently bathed, and as much as possible allowed to get between the lids; it may be used either hot or cold, whichever may be most grateful to the patient. In cases where the iritis is accompanied by suppuration in the iris or cornea, the eye must be kept bound up with lint soaked

and constantly kept wet with warm belladonna lotion. In those cases which are accompanied by severe pain this application will be found most soothing; a strong solution of atropine must also be used three or four times a day.

A peculiar form of erysipelatous inflammation affecting the eyelids (the lower one more especially), side of nose, and cheek (known as atropism), and caused by constant irritation of the tears and atropine solution, is not unfrequently met with when the treatment has been long continued. Some persons appear particularly prone to this form of inflammation, a very few applications being enough to set it up. It is frequently very obstinate and prevents entirely the use of atropine; it is best prevented by keeping the parts with which the tears and solution come in contact well greased with some simple ointment. Atropine gelatine should be used as a substitute for the solution, one of the small squares, or rather oblongs, into which the sheets are divided being placed on the conjunctiva of the lower lid as often as may appear necessary. Lately a solution of daturine, $\frac{1}{2}$ gr. to \mathfrak{ss} of water, has been used in the eye wards at Guy's, and found to act satisfactorily, causing little irritation in cases in which atropine was not tolerated.

3 and 4. The measures taken to obviate the tendency to the formation of new products will also go a great way towards relieving pain. The inflammation must be kept down by anti-phlogistic treatment, excepting in cases of iritis depending on debility. Leeches, from two to six, applied to the temple corresponding to the affected eye, considerably diminish the intensity of the inflammation, and often act like magic in relieving the most severe pain; they may be applied every third or fourth night if necessary; the artificial leech is also most useful. Blisters to the temples or behind the ears are beneficial, and in some cases a succession of them may be kept up if required. Of drugs, mercury is the most useful in checking the formation of inflammatory products. There is no better mode of administration than in the form of the old-fashioned and much-abused mercury and opium; a pill containing two to three grains of pil. hydrar. and half a grain of opium should be given every night and morning, or oftener, as long as may appear necessary. The effect must always be carefully watched, and the pills discontinued as soon as any inconvenience in biting hard crust or

biscuits is experienced. If there be severe pain opium must be given in larger doses, especially at night.¹ Hot fomentations of belladonna or poppy capsules, or a mixture of the two, give great relief in some cases of iritis accompanied by pain; in others the application of ice is found most agreeable. The patient's own sensations must always be consulted on these points, and he should be recommended to use either hot or cold applications, whichever affords him the greatest relief. It is only in severe cases of iritis that the rather energetic measures above described are necessary. In the greater number of cases all that is required is to pay attention to indications 1 and 2.

5. An operation is frequently required to remedy the results of iritis.

Where only a few synechiæ have formed, the continued use of a strong solution of atropine will generally be sufficient; slight adhesions yield very readily to this method of treatment, and in some cases where considerable adhesions of the pupillary margin to the lens capsule have taken place the action of atropine alone is sufficient to effect their separation, the attached portions becoming gradually drawn out into threads, which at length give way and shrink up, or are left as small projections at the pupillary margin. In cases where the adhesions are so firm and extensive as not to yield to atropine, operative procedure must be had recourse to, not only on account of the impairment of vision, but from the fact that adhesions of the iris, especially where some part of the pupil retains its normal mobility, are a constant source of irritation and favour the recurrence of attacks of iritis. The operation most frequently performed at the present day is iridectomy; the details however will not be entered into here. With regard to the position in which the new pupil should be made, no rule can be laid down; the conditions in each case must be taken as a guide. For instance, if the operation be performed to prevent recurrence in a case where the adhesions are few, the pupil clear, and vision fairly good, the portion of iris should be removed from the upper segment so as to bring the new pupil beneath the upper lid

¹ Since writing the above I have heard the employment of opium with extract of hyoscyamus (in pills containing half a grain of the former to two grains of the latter, taken repeatedly till almost poisonous effects have been produced) most highly spoken of, in cases of painful recurrent iritis.

and prevent as much as possible the resulting disfigurement. In cases of extensive synechiæ, with more or less blocking of the pupil, the iridectomy should be performed so as to remove as much as possible of that portion of iris which has contracted the most adhesions, but it will frequently be found that the iris tears away from the adhesions and leaves the pupillary margin attached to the lens capsule. If the iridectomy be performed for optical reasons, care must be taken to place the new pupil behind a clear portion of cornea; should the whole cornea be clear the pupil should be made in a direction downwards and inwards, as this allows rays of light to pass into the eyeball as nearly as possible in the axis of vision, which cuts the cornea rather in the inner and lower side of its own axis. In some cases of very extensive adhesions, closed pupil, or total posterior synechia, or in cases where the operation is likely to set up fresh inflammation and close the new pupil, iridectomy should be performed in two opposite directions, either upwards and downwards, or from side to side. This operation requires considerable care in performance, as two incisions have to be made simultaneously, with a knife held in each hand. Anterior synechiæ, as before stated, are not common as the results of uncomplicated iritis, but occur frequently where the iritis has been accompanied by suppuration or perforation of the cornea. They are often the source of considerable irritation from the constant drag upon the point of adhesion produced by the movements of the iris, and consequently require treatment. If the adhesion be small and of recent date, it is easily separated by making an incision into the anterior chamber at the margin of the cornea somewhere near it, and tearing it away with an iris-hook or small spatula. If more extensive, iridectomy must be performed, the portion of iris removed, including the adhesion, or, what is simpler and equally efficient, iridectomy should be performed in a direction opposite to the point where adhesion has taken place.

A CASE OF DIABETIC COMA, TREATED WITH PARTIAL SUCCESS BY THE INJECTION OF A SALINE SOLUTION INTO THE BLOOD.

By C. HILTON FAGGE, M.D.

It is well known that, among the immediate causes of death in diabetes, one is the supervention of coma; and, indeed, that it is relatively not uncommon for the disease to terminate in this way. So far as I am aware, there has hitherto been but one end to such a case when stupor has once developed itself. The patient's condition has generally been regarded as hopeless; nor do I know that any plan of treatment has as yet been proposed. I therefore think that, although its ultimate issue was unfavourable, I ought not to delay publishing the following case, in which decided success was for a time obtained by the injection of a warm saline solution into the blood. The patient, before the operation, lay comatose, with his eyes drawn up and half closed lids; his pulse was scarcely perceptible; he could not speak, and could scarcely swallow. Five hours later he was quite conscious, sat up in bed, answered questions, and took his medicine, holding his glass in his own hands. The improvement lasted for about twenty-four hours. In the meantime I took a step which I now exceedingly regret, and which I fear may have had much to do with the unfavourable change in the patient's state that shortly afterwards took place. I should observe that the diabetes had been entirely unchecked by treatment, the patient having taken no medicine from any

one, except a herbalist. It therefore seemed to me essential to take the most decided steps possible to arrest the flow of sugar through the kidneys. I gave strict directions that the fluid nourishment, which was given to him at short intervals as soon as he could swallow, should contain no starchy or saccharine principles; and I made up my mind from the first that, as soon as he should have rallied sufficiently, I would begin the administration of codeia, a remedy from which I have derived most satisfactory results in the treatment of diabetes since Dr. Pavy published his observations on the subject¹ in these Reports.

I have been in the habit of giving considerable doses of codeia, following in this respect the example of Dr. Pavy himself; and, therefore, thinking that the present case was one in which it was necessary to lose no time in making a decided impression in the complaint, I gave the patient a grain of codeia by mouth, sixteen and a half hours after he had recovered his consciousness. After this he gradually became drowsy, his pupils became contracted, and he died suddenly thirteen hours and a half after the administration of the drug.

¹ Perhaps the following brief notes may be of interest to some readers, in illustration of the value of this practice, which has not, I think, yet received such general acceptance as it deserves:—H. J—, æt. 32, came to me on March 21, 1870. He was passing about nine pints of urine in twenty-four hours, of sp. gr. 1043, loaded with sugar. He was so weak that he could scarcely walk upstairs, and was quite unfit for his business, which was that of a merchant. I dieted him strictly on Dr. Pavy's plan, and gave him codeia, at first in doses of half a grain three times daily, afterwards in doses which were rapidly raised, until he took two grains three times a day. By April 9 the urine was reduced to two and a half pints in twenty-four hours; and it was of sp. gr. 1018, containing not a trace of sugar. He was already feeling stronger and better. Before long he felt as well as ever he had been, and was able to remain at his business until 8 or 9 o'clock at night. On one occasion he began to eat a little ordinary bread, but a small quantity of sugar soon reappeared in the urine, and he could feel that he was not so well. The last time I saw him was on July 18, 1873. He was then perfectly well, except that he had some dyspeptic symptoms. He had gone on dieting himself regularly ever since I had last seen him (which was in December, 1871). I wished him now to try again the experiment of eating a little farinaceous food, but I found him exceedingly reluctant to do so, fearing lest he should imperil his then state of health. Surely such a case is highly satisfactory, occurring as it did in a young man, two of whose sisters had died of consumption, and who, I think, would certainly not have lived many months unless some treatment had succeeded in keeping the disease at bay.

The following brief notes of the case were kindly furnished to me by Mr. Nelson Kiddle, at that time the house physician.

James M—, æt. 38, admitted into Stephen Ward under the care of Dr. Hilton Fagge, February 14, 1873. Patient has been married three years, and has one child. In July, 1872, he noticed he was passing an excessive quantity of urine, and that he was very thirsty; these symptoms have continued till admission. He has complained of general weakness since September, 1872. In December he felt worse, and remained at home a week; after this he became as well as usual, and continued his work till February 8th, when he became weaker, and was obliged to remain at home. His appetite failed him on February 12th; he was delirious on the night of the 13th, and vomited once. He has had no fits nor convulsions. His bowels for several months have been irregular, sometimes not acting for seven or eight days. His appetite has been large since July, 1872. He has had no cough, and has only complained of great weakness. He has only been treated by a herbalist.

3 p.m.—On admission, patient is in a comatose condition; he lies with eyes drawn up and half closed lids; the pupils are equal; the radial pulse is scarcely perceptible; the body and limbs are cold; the breathing is slow and laboured; he does not answer questions. The blood contains an excess of white corpuscles. The urine drawn off is of sp. gr. 1030; it contains a large quantity of sugar and some albumen.

3.30.—Ordered brandy ℥ij in water. Mustard plasters to legs. He could scarcely swallow, the fluid seemed to stick in his throat.

4.45 p.m.—In the presence of Dr. Fagge, Mr. Frank Turner, the house surgeon, injected 26 oz. of a sol. of phosphate soda and chloride sodium, sp. gr. 1020, temp. 99°, into the right cephalic vein. No chloroform was given; only a few drops of very thick dark blood escaped from the wound; the patient did not appear to feel the operation.

6 p.m.—The pulse was decidedly stronger, and the breathing less laboured. Ordered

• Spt. Ammon. Aromat. 3ss. ex aqua ℥j; secundis horis.

9.30 p.m.—Sat up in bed and took his medicine, holding

the glass in his own hand, was for the first time quite conscious, and answered questions somewhat readily.

(Omit brandy.)

11.15. p.m.—In about same condition. Ordered

Spt. Vini Rect. 3j,
Spt. Ammon. Aromat. 3ss,
Glycerini 3j, ex aq. 3ii, secundis horis,
Eggs, beef tea, soda water.

Temp. 95.6°; pulse 78; resp. 26.

15th, 1 a.m.—He takes his nourishment and medicine without difficulty.

Temp. 95.7°; pulse 80; resp. 26.

4.15. a.m.—Temp. 95.7; pulse 108; resp. 28.

10 a.m.—Bowels unrelieved; urine sp. gr. 1021, and contains sugar and some albumen. Continues in same condition.

2 p.m.—Ordered

Codeinæ gr. j, st.

Temp. 96.5°; pulse 108; resp. 28.

10.30 p.m.—Is lying on his side, sleeping quietly, but every now and then rouses of his own accord. He takes all that is given him, and sometimes asks for nourishment. Pupils rather contracted (? effect of the codeia). The tongue is more moist. He does not put out his tongue so readily as before, and is slightly less conscious. The urine passed an hour ago was of sp. gr. 1020, reaction as before.

Temp. 97.5; pulse 108; resp. 28.

16th, 12.45 a.m.—He is more drowsy, but can be roused by speaking loudly to him. Tongue dry. When told to take some liquid, he said, "Yes sir," and swallowed a quarter of a pint of beef tea. Pupils contracted. He passed some urine half an hour ago.

16th, 3.30 a.m.—Was breathing with great difficulty when he died suddenly. The nurse who was watching him said she only noticed a change about two minutes before his death.

I made the post-mortem examination on the 16th. The body was moderately emaciated. The brain weighed 50 oz.; it was apparently quite healthy. The ventricles contained some fluid. The lungs appeared to be quite healthy. Some frothy fluid escaped from the cut surfaces. The heart weighed 11½ oz. The cavities contained the usual decolourized coagulum. The liver

weighed 68 oz. Its substance appeared normal. The spleen was healthy. The kidneys weighed 15 oz. The cortex appeared coarse; but there was no evidence of any marked change in their texture.

What suggested to my mind the advisability of injecting a saline solution into the blood in this case was the idea that the coma was due to the drain of water from the system, caused by the diabetes. I suppose that the hypothesis upon which I acted was essentially similar to that which formed the basis of the like treatment in the collapse of cholera. And it must be confessed that the results of experience as to this operation in cholera go far to dash to the ground the hopes that we might otherwise be inclined to cherish of its value in diabetic coma, if we were to be guided merely by the striking success that at first resulted from it in the case that I have been relating. For in cholera, as is well known, the result has generally been exactly what it was in this case of insensibility from diabetes. The patient has rallied in a way that appeared marvellous; he has sat up, and talked, and appeared in a fair way to recover; and afterwards, in the great majority of cases, the symptoms have returned with their former severity, and have proved fatal. Still, I think that there are grounds for waiting before we at once conclude that the ultimate result will necessarily always be the same in the disease now under consideration. In diabetes we have not to deal (so far as we know) with any subtle agency such as that which causes epidemic cholera. The disease is, to a great extent, amenable to medical treatment. We may at least hope that, when coma has set in, the injection of a saline solution into the blood may secure for us time to initiate such further medical treatment, and so enable us to avert the recurrence of the cerebral symptoms.

I must not fail to make the admission that it is far from certain that the real cause of diabetic coma is the abstraction of fluid from the blood, as I supposed. Dr. Pavy tells me that he has repeatedly seen coma set in, and prove rapidly fatal, in cases in which the disease had been for a long time kept completely in check by his treatment of dieting and the administration of codeia. For such cases, the theory above suggested certainly appears to be inapplicable; and it must be added that the injection of a saline solution into the blood would also appear much less

likely to be effectual in them, than in cases such as that which is the subject of this paper, and in which the disease had been left to itself, without any treatment, until the cerebral symptoms showed themselves.

The general conclusion to which I would come at the present time is, that the treatment of diabetic coma by the injection of a saline solution into the blood had sufficient success in my case to justify its repetition in similar cases; but that, until it has been tried again, we cannot say whether it will or will not be proved to be capable of permanently warding off the fatal termination which appears to be otherwise inevitable.

ON MECHANICAL APPLIANCES

FOR THE

TREATMENT OF FRACTURES OF THE
JAWS.

BY HENRY MOON.

IN the following paper it is proposed to describe certain appliances used in some cases of fractured jaw, which have been treated in Guy's Hospital during the past year, but before reference is made to particular cases, the desirability of treating fracture of the jaws generally by means of a well-adapted splint *within the mouth* will be advanced.

In the treatment of these cases ingenuity too often seems to have exhausted itself, when a piece of gutta serena has been moulded to the chin, and an ill-fitting wedge of cork placed between the teeth, where it seldom remains for more than a few days; or the teeth adjoining the fracture are wired together; such rough and ready methods as these, while they are not the most effective and comfortable means of setting in slight cases, altogether fail in a really difficult case, *i. e.* where there is a strong tendency to displacement of the fragments.

Mr. C. Heath in his excellent essay on "Injuries and Diseases of the Jaws" quotes and coincides with the opinion of Sir W. Fergusson and other surgeons:—"That the majority of cases do well with merely the simple bandage not very tightly

applied. From this dictum, if "doing well" means doing as well as they might do, I must—with all respect for the authority quoted—altogether dissent, and from among other cases which bear upon this point I will allude to two. The first was a case of fracture of the lower jaw *without displacement*—the patient—a young woman, of fairly healthy appearance, applied lately for advice in the surgery at Guy's. She complained of pain between the left bicuspid teeth, at the point where her jaw had been fractured two months previously. There was no displacement, but crepitus could still be felt; this fracture had been treated without an interdental splint. The second instance is that of a man, who some year or two ago was in one of our wards, and who among other severe injuries had a fracture of the lower jaw in front of the left canine tooth. This fracture, without any special treatment, at the end of eight weeks, when first I saw it, had not united in the slightest degree, the posterior fragment being at least three quarters of an inch higher than the anterior. The jaw was set, and a metal cap fitted to the teeth, and then at the end of six weeks good union was found to have taken place.

A properly made interdental splint tends to shorten the time required for union, averts pain, and prevents the formation of pus, which, when formed at the point of fracture, is apt to pocket in the soft parts around, and lastly, it insures the restoration of the exact form of the unfractured jaw. The last named result is of the first importance, as displacement by even a quarter of an inch will suffice to destroy the proper articulation of the teeth, and may cause considerable deformity and much discomfort to the patient.

For a description of the different oral splints which have been used, the reader is referred to Mr. Heath's work above named. In it are figured the several kinds alluded to in the following pages. The variety in form of the splints is due to the different devices employed for fixing them, but the principle on which they all act is that of holding the jaw in position by means of a cap accurately fitting the teeth on either side of the fracture. To make such a splint we must first have a perfectly correct model of the jaw as it was before it was fractured, and to obtain this when, as often happens, it is impossible to hold the several portions of the jaw in position while an impression

is taken, the following plan is adopted. A plaster of Paris counterpart of the upper or unfractured jaw is made in the usual way. An impression of the fractured jaw is taken without the fragments being brought into place, and a plaster model made from it—then, if the displacement is simply vertical, the model is sawn in two at the point of fracture and the two parts joined together again at their proper level; if there is longitudinal separation, as well as vertical displacement, the divided ends of the model, before they are rejoined, are pared down, and the two portions are brought into true position by articulating the teeth on them with their antagonist teeth of the other jaw. By the above means, if there be anything like a full complement of teeth in the jaws, this rectification of displacement can be carried out with great accuracy.

The best material with which to take impressions in these cases is "Stent"—a composition which is introduced into the mouth in a soft state, and in the course of a minute or two becomes hard, and therefore not subject to be put out of shape on withdrawal. It will often be found necessary to use an impression tray that is adapted to take only half the jaw.

Interdental splints may be made of vulcanite or of metal; if of the latter, gold may be used, but "dental alloy" answers the purpose perfectly. We will suppose a fracture between the second bicuspid and the first molar tooth of the lower jaw; here we should probably have the posterior fragment considerably higher than the anterior. A metal cap should be fitted to the amended model accurately adapted to all inequalities of the teeth, and passing for a quarter of an inch or so over the gum on the inner surface, and rather more on the outer; the number of teeth to be included in the splint would depend on the nature of the displacement; if it is simply vertical and not very difficult of reduction, the capping of two teeth on either side of the fracture will suffice, but if the fracture is oblique, some force may be required to keep the fragments from over-riding each other, and in such a case it may be desirable to extend the splint from the symphysis to the last molar. The metal cap should be strong enough to be quite unyielding, and its edges should be smoothly rounded.

If the model on which it has been made is correct, it is evident that as long as this splint is kept in position (which

can be judged of by its fitting closely down upon the teeth at both ends), the most perfect setting of the fracture is insured. To retain the splint in position, I have adopted the following methods—modifications of, and I think, improvements on the plans that have hitherto been in use. Taking the case imagined the masticatory surface of the metal cap having been brought to a level by soldering on metal where required, a vulcanite cap is made to fit the upper teeth which correspond to those capped below (see fig. 1). The vulcanite should fit over the gum on the buccal surface, and on the lingual side should be fitted to the palate (see fig. 2). The cap on the masticatory surface of the teeth is much thicker anteriorly, and gradually thins towards the back of the mouth, making, in fact, a wedge, which, when in place, will remain immovable. In applying it, the metal splint is firmly held down, so as to keep the fracture in position, and then the vulcanite wedge is introduced, and, by being filed, if necessary, is made to exert an even bearing on the upper surface of the metal splint. A thickness of vulcanite is left sufficient to keep the mouth open just wide enough to admit of the introduction of food. A four-tailed bandage is then firmly applied with a coronal band stitched to it to prevent slipping, or the bandage devised by Hamilton may be used. Of course, in a case where the jaw is fractured on both sides, the metal splint is carried round so as to include both fractures, and then the vulcanite wedges should be made to cap the back teeth on both sides, and be united by vulcanite passing round behind the front teeth, thus leaving room for the introduction of food in the front of the mouth. (A frame of this kind is constantly used by dentists in regulating children's front teeth.) Mr. Gunning, of New York, introduced an interdental splint for fractures with vertical displacement. This splint—made of vulcanite in *one* piece—was adapted to cap in the teeth and gums of both jaws, an opening being left in the front for feeding, speech, &c.; but I find the separate wedge-shaped cap answers perfectly as a retainer, while it takes up less room in the mouth, and gets over the practical difficulty of introducing a large apparatus in one piece into the mouth. It also avoids the difficulty that will be found in making such an apparatus with the exactitude necessary as regards the relative position of the jaws.

One advantage of using a metal splint for the fracture is, that when union has taken place, the vulcanite wedges or other retaining apparatus may be dispensed with, and the metal cap be kept in place for a few weeks longer by the means next to be described. This second plan of fixing (see fig. 1) requires that holes should be drilled in the metal splint before it is put into the mouth. These holes, or rather slits, are made at the level of the necks of the teeth that are to be used as fixing points,—one on either side of a tooth at the buccal surface, and two opposite to these on the lingual surface of the cap; the term buccal and not labial is used, as it is only from the canine backwards that we are sure of finding the triangular space between the necks of the teeth large enough for our purpose, which is the encircling the tooth, together with the portions of plate at its front and back, with a strong piece of binding wire. The slits should be drilled with care, their outer ends being opposite the triangular space between the teeth and the end which approaches the other slit being smoothly bevelled, that the wire, when twisted up tight, may escape being cut. This plan comes in very well to secure the splint in severe cases after union has been obtained, and I doubt not, will answer well as the sole means of fixing from the commencement of treatment, in cases where the tendency to displacement is not great, for instance, in single fractures occurring near the symphysis, one or more teeth may be encircled with wire at each end of the splint.. The advantage of this method over the plan of wiring together teeth adjacent to the fracture is obvious, as it does not cause irritation of the gum or tend to loosen or displace the teeth. A plan has been adopted of fixing the metal cap by means of strong wires soldered to each end of the cap, and bent so as to come out at each side of the mouth, and be curved down and imbedded in a gutta-percha splint moulded to the chin; but where the tendency to displacement is inconsiderable, the wiring-in of the splint seems simpler, and, where it is considerable, I should distrust the curved wires so fixed;—they certainly could not be made to exercise the pressure sometimes necessary at the back of the mouth. For the treatment of severe cases, the Lonsdale apparatus, as improved by Mr. Berkeley Hill (figured in Bryant's 'Surgery,' and in Heath's 'Essay'), no doubt satisfactorily fulfils its object, but the apparatus (figs. 4 and 5, in accompany-

ing plate) which was devised by Mr. Millikin, at my suggestion, possesses, I think, some advantages. It is readily adapted to a jaw of any size, will exert any amount of pressure over the back teeth, leaves the front of the mouth free for feeding, &c., and, being introduced separately from the cap, it is easily applied, and can be readily removed when desired without shifting the plate, which latter can be left *in situ*—fastened in with wire, as described above. I have also found it very useful in the final adjustment of the fracture beneath the cap, by the graduated pressure of the screw, first exerted on one side and then on the other. The manner of using this apparatus will be understood by reference to figs. 3, 4, and 5.

I will now give a short report of two cases of fracture, not chosen as specimens of successful treatment, but because they presented difficulties which will serve to illustrate well the methods of setting advanced in this paper.

The first is that of a man, æt. 28, of weakly appearance, who was admitted last July into Guy's, under the care of Mr. Birkett. He was brought insensible into the hospital with a scalp wound, and his lower jaw fractured on both sides (fig. 3). Patient *said* he had been knocked down and fallen on kerbstone. The right side of the jaw was fractured in front of the second molar, the posterior fragment being three quarters of an inch higher than the front of the jaw, which was drawn down so strongly by the muscles attached to the hyoid bone, that great force was required to bring the lower incisor teeth to anything like their proper level. On the left side a fracture was found in front of the first bicuspid. At Mr. Birkett's request, I fitted a splint to the jaw (see fig. 3), including in it the two fractures mentioned, but unfortunately failed to recognise a third fracture, which was present in front of the second molar of the left side, or the splint would, of course, have been made to pass beyond it. The splint was put on under chloroform, and fixed in place with the apparatus. (See figs. 4 and 5 which illustrate this case.) The behaviour of the three fractures was instructive, the two included in the splint uniting without suppuration, while the union of the third was attended with suppuration and some displacement. The fractures all occurred at points where teeth had been previously lost, and one of the chief difficulties in making an accurate splint for the case was the absence of teeth, only three remaining in the upper

jaw to serve as guides. After the lapse of four weeks, while attaching the splint with wires to the second right molar and the first left bicuspid, I discovered the third fracture, but concluded it would not be well to disturb it then, and the ill effects of the resulting displacement, as regards the bite, was rectified afterwards by filing the two teeth which came unduly in contact—an operation, which may be fairly had recourse to, if the filed surfaces are exposed to friction.

Case 2 was that of a man, æt. 20, who, in July last, was admitted into Job Ward, under Mr. Bryant's care. He had received on the left side of his face a blow which had fractured his lower jaw, just in front of the ascending ramus, between the second molar and wisdom tooth. This patient had square, strongly-developed jaws; his set of teeth was perfect, but the front ones were much worn down by an "edge bite," while his back ones had not attained the usual height above the gum—a condition which would have precluded the wiring together of the teeth, which plan of treatment was also rendered impossible by the fact that the lower left wisdom tooth, which was the sole occupant of the posterior fragment, was not fully erupted, its distal and buccal surfaces being covered in by gum. The posterior fragment of the jaw was drawn most forcibly outwards and upwards; the masticatory surface of the wisdom tooth being more than half an inch higher than the other teeth. The main body of the bone, having all the muscles, including the mylo-hyoideus, exerting unchecked traction towards the hyoid bone, was drawn very forcibly inwards and downwards. There was great external deformity, and the patient suffered much pain, which prevented sleep. On admission, there was considerable hæmorrhage from the wound in the mouth, and much swelling of the parts around. Mr. Bryant requested me to set the fracture; the difficulty lay in the very slight purchase obtainable on the posterior fragment. A metal cap (made of dental alloy) was placed on the lower teeth, and, in order to gain purchase, it was extended as far forward as the central incisors. The upper surface was rendered very strong and quite unbendable, by soldering on a plate of metal, which extended over the masticatory surface of the wisdom tooth. The splint capped in as much of the lingual surface of this tooth as was above the gum, and a narrow rim was turned down over the buccal and distal edges. The splint was kept in

place by a vulcanite wedge, which capped the upper teeth from the canine backwards, the vulcanite being also made to fill the place of the upper wisdom tooth, which had not been erupted. Reference to fig. 1 will make this arrangement clear, though it illustrates another case. A strong four-tailed bandage was applied.

Another method of setting fractured jaws, which Mr. G. E. Hammond says was adopted by him with great success during the Franco-German war and Siege of Paris, seems likely to be very useful. The following description of the plan is derived from the last May number of the 'Monthly Review of Dental Surgery.' A frame of strong iron wire is adapted to the fractured jaw; it is bent round, so as to encircle in one loop all or any desired number of the teeth at the level of their necks. The ends of the wire are soldered together, and the finer adjustments are given to the frame with a pair of small curved pliers. This collar is slipped over the teeth, and is tied in place by short pieces of thin binding wire passed round *each* tooth, and interlaced with the frame, as shown in the accompanying figure.

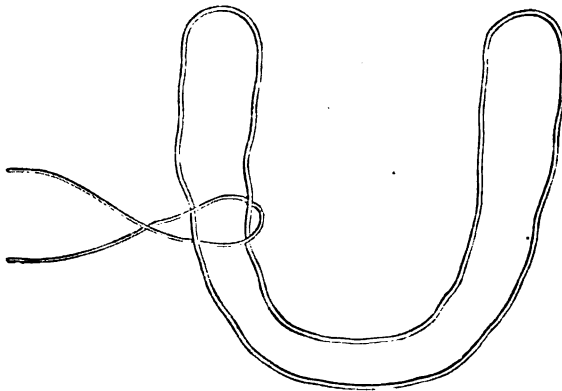


Figure illustrating Hammond's method of treating fractured jaws.

The two ends of each of the binding wires are twisted together in front until nearly tight, and are afterwards twisted quite tight, a loop on each side alternately being tightened up, so that even pressure may be exerted. The ends of wire are then cut off, and the remaining twisted ends are tucked in between the

teeth. A spirit wash is used for rinsing the mouth. The frame should be worn for six weeks, during which time the patient should confine himself to soft food. A case was lately quite successfully treated in this manner, in the surgery at Guy's, by Mr. Golding Bird. The patient, a man *æt.* 26, had his lower jaw fractured at the symphysis by a blow of the fist. The tendency to displacement was not great. Two weeks after the injury the wire splint was applied, and good union was obtained in six weeks. Mr. Hammond claims for the splint superiority over all others, but it is not applicable in all cases. For instance, in the above-related case of Mr. Bryant's patient, it could not have been applied.

To meet other special cases, modifications of the capping treatment may be used. Thus, in a case where a fracture occurs at the back of the mouth, where no teeth are standing, a vulcanite cap may be fitted to the upper teeth, having its lower surface, which would come in contact with the fractured under jaw, coated with gutta percha. Or two vulcanite caps may be made so that their plain surfaces may meet equidistant from the gums; a four-tailed or a Hamilton's bandage being used, of course, in all such cases.

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DESCRIPTION OF PLATES,

Illustrating Mr. Moon's Paper on Mechanical Appliances for the Treatment of Fractures of the Jaw.

Fig. 1.—Shows two modes of retaining a metal splint in place in the mouth.

- A. Metal splint, capping the bicusps and molars of fractured lower jaw.
- B. Wedge-shaped vulcanite cap fitted to upper jaw.
- C. Pliers grasping the free ends of a loop of binding wire, which will be twisted upon itself by rotating the pliers; the wire is seen in position around the first bicuspid.

Fig. 2.—A vertical section through the upper wedge-shaped vulcanite cap.

- A. The lower surface of the wedge, which can be filed to the proper inclination.

Fig. 3.—Lower jaw (Case 1) fractured in three places.

- A. Metal cap (wired on) fitted over two of the fractures.
- B. The metal on the masticatory surface of molar increased in thickness and levelled as the point for the cap B of fig. 4 to rest upon. The caps on the opposite side rested over the bicuspid.

Fig. 4.—Shows portion of apparatus for retaining metal splint on the teeth.

- A. Vertical plate at right angles to, and united with, horizontal plate, which passes beneath the chin; the narrow perforated horizontal plates which project forward keep in place the upright rods.
- B. Upright steel rods, with screw cut at lower end. By screwing up the nut C the horizontal rod D is lowered, and its pivoting cap B is brought to bear upon the metal splint.
- C. A screw which fixes D.

Fig. 5.—Splint *in situ*. The two halves (AB) are united beneath the chin by a sliding bar fixed by a screw, which enables the splint to be adapted to any jaw. One band of webbing is carried round the back of the head, another over the vertex; these are fastened by buckles, and kept in place by a connecting band.

Fig 1.

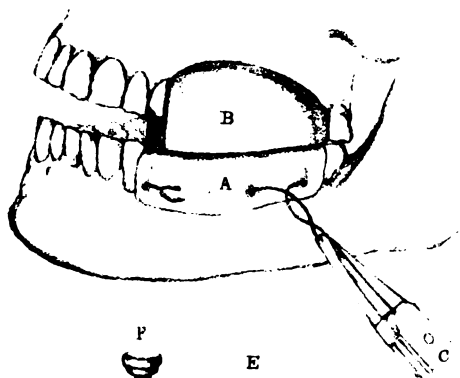


Fig 2



Fig 4.

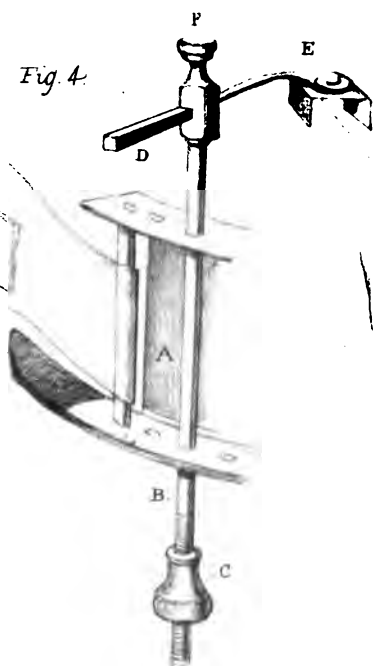


Fig 3.

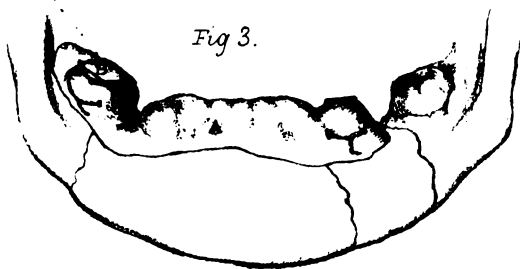


Fig 5.



CASES ILLUSTRATING
SOME
REMOTE EFFECTS OF SPINAL
DEFORMITIES.

By C. HILTON FAGGE, M.D.

No one, as I think, could take note of the great diminution in the capacity of the chest in cases of extreme spinal curvature, and also of the impairment of the movements of the ribs, without being prepared to find that some serious results should accrue from interference with the respiratory function. And I believe that physicians are practically familiar with the fact that persons whose spines are deformed are apt to die at a comparatively early age, with symptoms of dyspnoea, and even of dropsy, for which no complete explanation can be found in any disease of the viscera themselves. Yet, in referring to those surgical works with which I happen to be most familiar I do not find any allusion to such a circumstance. For instance, Mr. Shaw, in his article in the 'System of Surgery'¹ writes as follows: "although in extreme cases of distortion the compages of the thoracic and abdominal viscera present both singular irregularities, and all the viscera contained in them undergo a new moulding of their figure, to adapt them to the changes, yet each organ performs its function soundly."

It therefore appears to me that as we happen within the last

¹ Second edition, vol. v, p. 867.

two years and a half to have had in the post-mortem room as many as six cases of extreme curvature of the spine, in all of which death was more or less completely attributable to the remote effects of the deformity, it may be interesting to the readers of these Reports to have the cases in question placed side by side.

I will first take a very typical instance of extreme angular curvature, which came under my observation in the pathological department in the course of last summer. The patient, who had been under the care of Dr. Moxon, was a young man, æt. 24, in whom the deformity had resulted from disease of the vertebræ, dating from infancy. His back was extremely bowed, the spinous processes forming no sharp angle, but simply a rounded hump. I may remark, parenthetically, that I had often before wondered, when I had seen similar cases during life, whether such an even rounded curve could possibly arise from the falling together and ankylosis of the bodies of the vertebræ. In the case under consideration it was found after death that this was really so, and that the loss of height in the spinal column was far greater than would, I think, have been supposed. Within the sweeping curve of the spinous processes the bodies formed a very sharp angle, so narrow that *from the lower border of the third dorsal to the upper border of the third lumbar vertebra measured only an inch and three quarters in a straight line.* It is sufficiently evident that such a state of the spine as this must have interfered greatly with the thoracic viscera. And, in addition, the ribs, instead of curving outwards, ran almost straight forwards from their angles. The lungs, when distended with the bellows, were found to be much altered in shape. Their height was greatly diminished, and their antero-posterior diameter much augmented.

The tissue of the lungs generally was particularly healthy, firm and crepitant. There was a little emphysema of their anterior edges. The bronchial tubes appeared to be perfectly healthy. The left side of the heart was normal.

I am well aware of the difficulty which is sometimes met with in demonstrating by dissection the presence of bronchitis, even when that disease had undoubtedly existed, and had even been the cause of death. Still I think it will be admitted that, so

far as anatomical evidence goes, we have no means of accounting for the symptoms of impeded circulation through the pulmonary system of vessels, which had existed during life, except by attributing them to impairment in the respiratory function, consequent on the spinal deformity. These symptoms had been extreme. The patient's favorite position in bed was to lie on his belly, resting on his elbows and propping up his head with his hands. His face and lips were of a dark purple hue. His hands were dark, and especially the extremities of the fingers and nails. There was great œdema of the legs and feet, which were cold, and of the same colour as his hands. At the post-mortem examination other appearances were found, which pointed in the same direction. The right side of the heart was greatly dilated and hypertrophied, and the smaller branches of the pulmonary artery were atheromatous.

It is true that the patient attributed all his sufferings to a cold which he said he had caught in the previous winter, and to the accompanying cough and profuse expectoration, which had never left him. He still had a troublesome cough after his admission into the hospital, with tenacious muco-purulent sputum: and on auscultation crepitation was audible from apex to base of the lungs on both sides. In face of these observations it would certainly be a bold thing to deny that bronchitis played a part in the production of the fatal symptoms. But indeed I am not concerned to deny this, any more than I should be to exclude the existence of bronchitis as a factor in the causation of similar symptoms in a case of morbus cordis. All pathologists admit that in cases of valvular disease of the heart bronchitis is often very largely concerned in bringing about the dyspnœa and dropsy, and that this, perhaps more than any other condition, determines the time at which the symptoms under consideration show themselves. I have no wish to claim for spinal curvature a larger share in the production of dyspnœa and dropsy than belongs to mitral disease.

CASE 1.—*Bronchitis ; Dropsy and Erysipelas of the Lower Extremities ; Angular Curvature of the Spine ; Death.*

(Reported by Mr. A. HOOPER.)

Henry C—, twenty-four years of age, a vegetable salesman's assistant, a young man who had always enjoyed good health, was admitted into Philip Ward, under Dr. Moxon, on the 29th April, 1873. He stated that when an infant he had a fall, and two years after his back began to grow out. No treatment was adopted, and it continued to get worse for two or three years. He had not been a hard drinker, but generally took a little raw gin on going to the market in early morning.

His present illness commenced a fortnight before the previous Christmas, when he took cold and was troubled with a cough, attended with a good deal of expectoration and constant bleeding from the nose. He continued his work until ten weeks before admission; when getting worse he was obliged to keep in doors, and had only been out of the house once since then, but was not confined to his bed. He was under treatment for six weeks, but not getting better, he was obliged to come to Guy's Hospital. He never had any venereal disease, and never spat blood.

His father and mother were living and well, and he had eight brothers and sisters, only one being dead; he knew of no specific disease of any kind in the family.

On admission, the man presented a deformed appearance, having a very prominent angular curvature of the spine about the middle and lower dorsal regions, and also a pigeon-shaped chest; he was most easy when sitting up or leaning over a chair. When in bed he lay on his abdomen, resting on his elbow, and propping up his head between his hands. His face was of a dark purple hue, as also were his lips; his hands were dark in colour, especially the extremities of his fingers and nails. The pupils were widely dilated, and did not act well to light; he complained of occasionally seeing double.

His feet and legs were very œdematous, the former being of the same colour as his hands, and were cold. His cough

was very troublesome, being worse at night, and he expectorated some very tenacious muco-purulent sputum. His bowels were relaxed, and he passed a pretty good quantity of urine.

There was a well-marked rash of herpes zoster on his right side, running from the centre of the spine round the side to his abdomen; it was an inch and a half broad, and of a vesicular character. The resonance of his lungs on both sides anteriorly was pretty good; there was small crepitation at the apex. Posteriorly the resonance was somewhat deficient at the base of the right lung, and there was slight tubular breathing, crepitation being audible from apex to base on both sides.

The apex beat of the heart was felt in a direct line with the nipple, and about an inch below. There was no murmur audible. Pulse 120, pretty full.

The liver seemed normal, but there was a difficulty in determining this, owing to the chest being thrust into the pelvis.

The urine contained no albumen; sp. gr. 1012.

May 3rd.—He slept pretty well, but had some delirium; his breathing was very short and quick.

He was ordered wine, beef tea, milk, and corn flour, Mist. Amygdalæ and Tr. Lobeliæ Æther.

7th.—He was about the same as when admitted, the breathing on the right side being of a supplementary character, with slight crepitation at base; behind the left side there was loud crepitation, with a peculiar blowing sound at the inferior angle of the scapula. The face had still the cyanotic appearance, and the feet and legs were œdematous. The rash had passed through the pustular stage, and was scabbing and fading. His diarrhœa was better, but he did not pass so much water. The following day very loud rhonchus was audible on the right side anteriorly, though the sputum was changing in quality, being thinner and frothy. He was ordered Tinct. Serpentariæ, Tinct. Camph. Co. and carbonate of ammonia, also brandy.

12th.—The colour of his face was more natural. In other respects he was about the same, excepting that the expectoration had again become very tenacious.

17th.—He was not so well, he had been delirious in the night and would get out of bed. His feet and legs had

become excessively cedematous, looking as if they would burst; there was some oozing of fluid on the inner side of his right calf. Pulse 112, resp. 36.

20th.—Two punctures were made about half an inch deep near the ankle; the fluid at first ran in a continuous stream and afterwards dropped quickly; the legs became much reduced in size and the feet greatly relieved.

26th.—The patient was better in every respect, the fluid had been constantly trickling from the punctures, and the feet were becoming almost normal in size, but the legs were still cedematous. There was not so much crepitation in his chest and his general aspect was more natural; he had hardly any cough and did not expectorate at all.

31st.—The left ankle had ceased running and since then it had become very hot and painful; an inflammatory blush extended over the whole of the inner side of the joint. The right one also was becoming hot and painful. His tongue was thickly coated with a dirty white fur, his cough had also returned, with expectoration of a purulent character.

June 2nd.—He was a little better; the ankles were still inflamed but there was no discharge. Water dressings were applied. Edema of feet and legs began to increase; they were punctured the following day in four places, with a needle. Since then the man was somewhat easier. Temp. 100.

4th.—The feet were very tense, and as no serum ran from the punctures two incisions were again made, which let out a little pus and blood. He then became a little easier. But the erysipelas was extending.

6th.—Two other incisions were made on the inner side of the leg, about two inches above the inner malleolus; a good deal of serum escaped from one, after which the patient felt much easier. P. 124.

9th.—The right leg was much more swollen; the cuticle on the posterior surface of the calf had given way and serum escaped; there was no discharge from the last incision made, but a copious flow of thick pus from the first incision.

11th.—The patient seemed very weak, the left leg seemed to be getting on well, but the right one was much swollen and inflamed, discharging a good deal of pus. Pulse 115, temp. 99.6.

14th.—At 6 a.m. the man changed for the worse, his voice becoming thick. He never rallied, but gradually sank at 12.30, his intellect remaining perfectly clear to the end.

The post-mortem examination was made by Dr. Fagge.

Both legs were greatly swollen, with redness and exfoliation of cuticle.

The back was rounded, the spinous processes projecting in the median line and not forming an angle. When the thoracic and abdominal viscera were removed, it was found that the dorsal and lumbar vertebræ were bent backwards, forming an acute angle. From the lower border of the third dorsal vertebra to the upper border of the third lumbar there was a distance of one and three quarters of an inch. This part of the spine was removed and a vertical section made; it then was found that there was scarcely any mobility in these vertebræ; the intervertebral substances were exceedingly thin; indeed it appeared as if most of the vertebræ were in contact and were fused together slightly at their margins. There were thirteen vertebræ in the mass removed; but only ten bodies could be counted. There were, however, the right number of intervertebral foramina, and the position of these enabled it to be determined that a small wedge-shaped mass that constituted the apex of the triangle formed by the bodies arose by the fusion of three original vertebræ, and that the body below this arose by a fusion of two vertebræ.¹ The spinal canal of course formed a sharp angle and was reduced in diameter, but apparently was big enough to accommodate the cord. The ribs ran forwards from their angles, not spreading outwards as usual; the sternum thus projected unduly. There were adhesions both of the lungs to the chest, and of the different lobes of the lungs between themselves.

The lungs were greatly altered in shape when distended by the bellows; their weight was much diminished, and their antero-posterior diameter greatly increased; there was slight emphysema of the anterior edges. The lung tissue generally was particularly healthy-looking, firm, and crepitant.

The bronchial tubes presented no appreciable change; they were free from secretion; on cutting through the edges of the

¹ The state of the spine in this case was so exactly similar to that in Case 2, that I may refer the reader to the woodcut on p. 200 in illustration of the text.

lungs in different places no purulent points could be seen. The tubes were not dilated nor thickened; their mucous membrane was thin and not reddened.

The heart weighed fourteen ounces; it was broad and rounded; the right cavities were markedly dilated and hypertrophied; this was, perhaps, especially the case with the right auricle, which had fleshy, rigid walls, reducing the left auricle to insignificance. The right ventricle, again, was thick and hard, and its cavity much enlarged, so that the septum projected into the left ventricle, exactly reversing the natural state of affairs. The tricuspid orifice was not particularly enlarged, four fingers nearly filling it.

The pulmonary artery was not notably thickened at its base, being decidedly thinner than the aorta; its main branches were not atheromatous, but its smaller ramifications were distinctly so.

The left side of the heart and its valves were healthy.

The colon was greatly distended and bent downwards, so as to make the most prominent object when the abdomen was opened.

The liver weighed forty ounces, and was healthy.

The spleen weighed three and a half ounces; it also was firm and healthy.

The kidneys weighed ten ounces; they were healthy, and not congested.

The next case is very similar in many respects to that just related. It occurred in a young man, æt. 31, who died two days after his admission into the hospital, under my care. He had had a deformed spine since he was four years old. A point of interest in this case is that at the time when active disease of the spine existed there was said to have been complete paralysis and loss of sensation in the lower limbs, from which he afterwards completely recovered. This is well known to be no very infrequent occurrence in such cases. I have seen one, and I think two well-marked instances of it in Dr. Wilks' wards within the last three or four years.

The state of the spine in the patient whose case is now under consideration was very nearly the same as in Case 1, and his general symptoms were also very similar. He had the

same lividity of countenance, orthopnoea, and dropsy of the lower extremities. There was some difference in the way in which these symptoms appeared to have commenced in the present case. The patient said he had suffered from cough at times; but he did not, like the former patient, attribute the onset of his fatal symptoms to a cold, nor did he say anything about cough as having been concerned in their production. He said that "two months before admission he noticed that his breath was becoming short, and that at last he was unable to walk ten yards without great difficulty."

These symptoms were, doubtless, caused by the disease of the aortic valves, which probably commenced or became aggravated about this time. Otherwise it would be remarkable that his symptoms should have first appeared in the month of June, when catarrhal affections are by no means common, and that his death should have taken place in August, at a time when, probably, there was not a single case of severe bronchitis within the wards of the hospital. In connection with this it may be noted that, in Case 1, although the symptoms of dyspnoea and dropsy were ascribed, at their commencement, to a cold caught at Christmas time, yet these symptoms showed no tendency to abate as the weather grew warmer, and that it was in June that they proved fatal.

As in Case 1, the right side of the heart was found much enlarged in Case 2; but in the latter case there was an important pathological change, which was wanting in the former. The valves of the left side of the heart were in a state of acute inflammation, both the aortic and mitral valves being covered with vegetations. I was at first completely at a loss to explain the occurrence of such disease in a case in which, owing to the impeded circulation through the lungs, I had supposed the tension in the aortic system to be rather diminished than excessive; but I subsequently found that the descending aorta was drawn inwards into the curve formed by the dorsal vertebrae, and bent upon itself. In this respect it differed from the oesophagus, which ran straight downwards without attempting to follow the curve made by the spine. The difference was, no doubt, due to the fact that the aorta was fixed backwards by the several intercostal arteries arising from its posterior wall. It appears to me that the sharp angle formed

by the great artery must have narrowed its channel considerably, and dammed up the blood, so as to cause a strain on the valves above, thus causing the endocarditis.

It is an interesting question whether this narrowing of the descending aorta may not have given rise to that systolic murmur, which (as is stated in Mr. Fry's report of the case) was heard "very plainly just to the left of the most prominent part of the spine." Probably also the supply of arterial blood to the abdominal viscera and the lower extremities was diminished by it. This may have been the explanation of the coldness of the limbs, to which the patient said he was subject, and also of the scanty secretion of urine. He told Mr. Fry that he never passed more than a pint of urine in the twenty-four hours, and that since his breath had been bad the quantity had been still less. When admitted he declared that he had passed no water for three or four days, and that he had no desire to do so. I have since had an opportunity of inquiring about the existence of similar symptoms in another patient who has deformity of the spine from angular curvature, and who also has recovered completely from a paraplegia which accompanied the commencement of his spinal disease. He told me that he was very subject to coldness in the lower limbs, but assured me that the urinary secretion was of fair quantity.

*CASE 2.—Aortic Disease ; Angular Curvature of Spine ;
Death.*

(Reported by Mr. Fry.)

Charles W—, æt. 31, was admitted into Philip Ward under Dr. Fagge (in the absence of Dr. Habershon), on the 9th August, 1873. When four years old he fell down a cellar and hurt his back. This was followed by immediate loss of power and sensation in both legs, but no difficulty with the bladder. He was laid up for twelve months, during which time the back became gradually curved, but power and sensation returned ; he always lived soberly, but suffered from cough at times.

Two months before admission he noticed his breath was becoming short, and at last he was unable to walk ten yards without great difficulty ; his thighs began to swell ; the swelling

gradually spread down to his feet, and two days before admission his stomach swelled. He had never been accustomed to pass more than a pint of water in twenty-four hours, and since his breath got bad the quantity had much diminished. During the last week he had spat small quantities of blood.

With regard to his family history, he stated that his father and mother were dead; the former died of rheumatism; one brother and two sisters were living and well.

On admission.—His abdomen was found to be very small and round and greatly distended, and giving a dull sound on percussion all over. The limits of the liver and spleen could not be defined; he had not passed water for three or four days, and had no desire to do so: but when told some was required for examination, he passed about a pint of very high-coloured urine—sp. gr. 1020; this became slightly smoky with heat. His voice was weak, respiration hurried (32); chest very small and prominent; percussion fair, and breath-sounds very audible; there was no bronchophony.

Cardiac dulness was not defined; the apex beat was apparently lower than normal; at the apex there was a loud systolic, whiffing bruit: this was heard also in the axilla and behind, where it was very plain just to the left of the most prominent part of the spine, being less distinct on the right side; at the base of the heart there was a to-and-fro bruit; the pulse in the right radial artery was very small; the left one full and regular, 112.

The deformity in his back was rather a curve than a projecting angle, and inclined slightly to the left side.

He was a thin, pale man, with very congested face, and his breath was so short that he was unable to lie down in bed, but sat up with his feet drawn up; his skin was moist; his legs and feet much swollen, pitting on pressure, the latter being blue and cold.

August 11th.—Dr. Fagge ordered the patient to be cupped to 4 oz., but so much blood would not flow. The bleeding, however, seemed to give him temporary relief, and he was better, but later in the day he complained of his stomach, when linseed poultices were applied and an injection of morphia given. He, however, became weaker in the evening, and died quietly about 11, being conscious to the last.

The post-mortem examination was made by Dr. Fagge.

The prominent part of the spine being removed, and a longitudinal section made, it was found that, corresponding with the rounded curve of the spine, the bodies made a very sharp angle, many of them, probably seven or eight bodies, being fused together in the apex of this angle. The



Figure showing vertical section of the spine in Case 2.

only evidence of existing disease was the presence of some cheesy matter between the dura mater and the bones for a considerable distance down the affected region; this projected into irregular spaces in the bodies of the vertebræ. The spinal canal was of fair diameter throughout, and formed an uniform curve. The cord seemed healthy.

The lungs were very small, their back parts airless, but there seemed to be no disease in them.

The heart weighed 16 oz., both the right and left ventricle being dilated and hypertrophied; the right auricle was also dilated.

The two anterior aortic valves were adherent together, and prolonged into a lip-like mass, that was retroverted and covered with vegetations. The posterior flap was also thickened, and its edge retroverted; it only had vegetations on its right half;

these would have touched the vegetations on the left half of the other mass, and so were, doubtless, set up by friction. The large retroverted flap had also set up vegetations on the surface of the ventricle below by contact, though not in any quantity. There was no disease of the aortic walls set up by contact. The aorta was drawn inwards into the curve formed by the dorsal vertebræ; in this respect it differed from the œsophagus, into which I passed a probe, and found it to run straight on through the thorax, without following the course of the spine. Doubtless the aorta was fixed by the intercostal arteries, two of which came off just at a point where the aorta was bent on itself by the spinal curvature. There were no adhesions, nor was the aorta in any way involved in disease, but there was no doubt that its calibre had been a good deal narrowed.

The liver was much distorted in shape by the spinal disease, and markedly nutmeg.

The spleen was small, and moderately firm.

The kidneys were rounded and remarkably thick (? adjusted in form to the deformed thick chest and abdomen). On section their surface was glistening and indurated, as in cases of morbus cordis.

In the next two cases there was extreme lateral curvature of the spine. In Case 3 this produced so great a diminution in the capacity of the right side of the chest, that from the anterior surface of the bodies of the dorsal vertebræ to the middle of the ribs there was a space of only *two inches*. It is remarkable that in the clinical report, taken by a very industrious student, no mention is made of the fact that this patient's chest was in any way deformed. The symptoms in both Cases 3 and 4 were very similar to those in the cases of angular curvature already related: extreme dyspnœa, inability to lie down in bed, ascites, and anasarca. In Case 3 the face was anæmic; in Case 4 it was highly congested. In neither case was there after death anatomical proof that much bronchitis had existed, but during life both patients had complained more or less of cough and expectoration. In each instance the right side of the heart was found enlarged and thickened, as might have been anticipated from the general nature of the symptoms.

But in Case 3 there was another marked condition which appears to be less consonant with one's expectations; the left chambers of the heart were likewise much dilated and hypertrophied. I was at the time quite unable to account for this fact, nor am I now able to explain it. I can only suggest that it may have been due to some interference with the natural course and position of the aorta, similar to that which existed in Case 2, and to which I have been inclined to attribute the occurrence of endocarditis in that case. In Case 4 also it is noted that the left ventricle was stronger than natural.

CASE 3.—Lateral Curvature of Spine ; Dilated Heart ; Dropsy ; Death.

(Reported by Mr. C. E. BARNARD.)

Mary G —, 55 years of age, was admitted on 31st October, 1872, into Addison Ward, under Dr. Habershon, her condition being as follows:—She was well nourished; her face anæmic, with a somewhat distressed expression. Her breathing was apparently healthy. First sound of heart was roughened and prolonged, but distinct. Second sound short and obscured.

There was general anasarca of all her limbs, and ascites; but the parietes of the abdomen were so œdematous that fluctuation could be but indistinctly perceived. There was no enlargement of the liver or of the other abdominal viscera. Urine sp. gr. 1020, slightly albuminous and loaded with urates. Under the microscope only lithates could be seen.

It appeared that her father had died from a ruptured blood-vessel, and that a brother had also died from the same cause. She herself had enjoyed good health till seven months ago, when she began to feel shortness of breath. Two months later the dyspnœa increased so much that she could not go up and down stairs without feeling exhausted. She at the same time had a cough and expectoration. She went to a dispensary where she was told it was an attack of asthma. She was much relieved by medicine that was given her, and became quite well in a month. Since then she felt no trouble with her breathing, till about eight weeks before admission, when she went to St. Thomas's Hospital complaining of short-

ness of breath; but had only a slight cough. She had no swelling in any part of her body. She was given some medicine, and three or four days after, she noticed her legs began to swell, and then her abdomen and face. She had been laid up in bed ever since. The swelling in her face decreased, but that in her abdomen and legs increased. She had always passed a moderate quantity of urine, which was high coloured, but never contained blood. For the last six weeks before admission, she had not been able to lie down in bed all night.

November 6th.—She felt somewhat relieved by the rest. Her left leg had burst in one or two places from the tension caused by the fluid. The urine was very scanty, and still loaded with lithates. She passed not more than sixteen ounces in twenty-four hours. She was ordered *Mist. Salin. with Pot. Nit. and Pil. Scillæ c. Hydr.*

12th.—She looked more anæmic than when admitted; her lips were pale and bloodless. The swelling in her legs had but little diminished, but that of her abdomen very much so. She passed more water, which was still loaded with lithates.

13th.—She died early in the morning.

The post-mortem examination was made by Dr. Fagge.

The arteries of the head were slightly atheromatous. The brain weighed forty-eight ounces: it was rather congested, but otherwise healthy.

There was extreme lateral curvature of the spine, the curve projecting to the left at the upper part of the dorsal vertebræ; to the right lower down, about their middle. The ribs were flattened on both sides, but especially the right, so that from the bodies of the vertebræ to the middle of the ribs measured just two inches. In the back, the curve was not so manifest, because she was so fat, but the chest was very small in proportion to the great size of the abdomen and pelvis.

The right lung looked small; both lungs were very full of blood, which oozed abundantly from their surface; but there was no apoplexy nor pneumonia; the upper parts were decidedly œdematous; there was very little, if any emphysema. The tubes contained frothy fluid, and were reddened, but there was no proof of much bronchitis.

The heart weighed nineteen and a half ounces, it was generally dilated and hypertrophied. The dilatation and hyper-

trophy were at least as great, if not greater in the left ventricle than in any other chamber. The septum was markedly convex towards the right ventricle.

Right side.—The auricle was not particularly dilated. The valves allowed about six fingers to pass. The pulmonary artery was not thickened.

Left side.—The auricular appendix was elongated, not opened out.

The mitral valve was good; it measured a little under two inches from aortic valve to apex of anterior segment. The aortic valves were healthy.

The muscular fibre of the heart was good, and fat moderate. The lower part of the aorta was nearly healthy, but the arch presented many calcareous patches and puckerings. Thus the entrance of the left subclavian artery was decidedly narrowed by a calcareous plate on one side of it. Again, where the aorta was passing near the left bronchus, there was a calcareous plate of considerable size, with much puckering of the aortic walls. The parts were cut open, before attention was drawn to this, and, therefore, it was not possible to determine whether the calibre of the aorta was narrowed. The abdominal aorta contained some calcareous plates, but was elastic. The peritoneum contained a good deal of fluid. The stomach was rather reddened, with much mucus.

The liver was enlarged and congested. The spleen weighed ten ounces; it was firm, and of a dark colour generally, looking as if hæmorrhage had occurred into its substance.

The kidneys were deeply congested, especially the pyramids which almost looked ecchymosed; the arteries looked rather rigid, like quills on the cut surface. The surface of the kidney was quite smooth and healthy.

The uterus was rounded from a polypus which was adherent to its posterior wall near the fundus, it was moulded to the cavity, and its lower end tapered to fit the cavity. It was soft, about the size of a large chestnut. On section, it presented numerous cysts, appearing elongated in form.

**CASE 4.—*Lateral Curvature of the Spine ; Bronchitis ;
Edema of the Lungs ; Dilated Heart ; Albuminuria ; Death.***

(Reported by Mr. C. S. TICKHURST.)

Alfred W—, a barman, aged 27, whose family history was good, and who had, with the exception of a soft chancre and bubo two years previously, suffered from no serious illness, was admitted into John Ward under Dr. Habershon, on the 20th Dec. 1871.

He had been in the habit of working very hard, getting up at seven, and working till half-past twelve at night, drinking brandy freely, as much as half a pint a day. He had suffered from a winter cough for ten years, but had been pretty well up to three months before admission, when he caught cold, and spat up a quantity of frothy phlegm, but no blood. He was very restless at night, having very bad dreams ; he became very drowsy, dropping off to sleep at any time, over a meal for instance, and waking in a fright. His appetite failed him and his breathing became very short ; his bowels were open ; the evacuations liquid and dark coloured ; he had no pain anywhere. His legs had been swollen, but were not so on admission. He had had two bad attacks of dyspnoea, once when putting a man out of the bar of the public house, falling down insensible and becoming black in the face, the second time when carrying a pair of steps, soon after the first attack.

On admission he looked as if he were suffering from deficient oxygenation of the blood, his ears, lips, and face being highly congested ; he answered in a sleepy sort of way, his eyes being half closed, the right one being more prominent, and the pupil smaller than the left. The left side of the neck also was more prominent than the right, making it look as if his head were awry. The vertebræ could be felt to be distorted on the left side of his neck ; there was no trace of the left deltoid, and he could not lift the humerus at all. This had been the case for ten years.

The chest was prominent and round, the right side small and flattened ; during inspiration the right side was drawn over to the left, most of the respiratory movements being performed

by the diaphragm. There was a double lateral curvature of the spine. Resonance was better on the right side anteriorly than on the left. Prolonged respiration and mucous râles were heard generally over the chest. There was slight bronchophony on the left side posteriorly, with tremulousness of voice. There was slight œdema of legs and chest walls. Heart sounds were normal. Urine, sp. gr. 1015, of alkaline reaction; heat produced a frothiness, and when acidulated with acetic acid a white cloudiness of albumen; nitric acid to the cold urine threw down slight albumen.

Dec. 2nd.—He continued to be very restless and drowsy. He was ordered to take Mist. Senegæ and Pil. Hyd. c. Scill.

28th.—He lay on his stomach, as if it were easier for him to breathe so; the chest-sounds were altered, little air entering the chest on the left side anteriorly; there was dulness on percussion, minute crepitation being heard all over the chest. Temp. 97·6°. A blister was applied to his chest.

January 1st, 1872.—There was a good deal of dyspnoea and œdema of scrotum and penis.

4th.—Dyspnoea was better; the penis and scrotum were much swollen; venesection was performed, six ounces of blood being taken away, and the penis was punctured; he became easier, the breathing being less laboured and face less congested. Pulse 100; resp. 32; temp. 97·1°.

8th.—Very little air entered the right lung; there was large crepitation, especially on the left side. The ascites was increasing.

9th.—The skin had cracked over the scrotum, allowing the escape of fluid and some blood, and he passed quite a pint of blood from his rectum.

10th.—He passed blood again from his rectum, and also in his water. Sp. gr. 1019. The blood was bright red. The patient died on the 12th, being found dead at 5 o'clock in the morning.

The post-mortem examination was made by Dr. Moxon.

The brain was congested and healthy.

The chest was deformed, there being a strongly-marked curve to the right; the ribs were natural in shape, when removed and compared with the other side, the alteration depending on their obliquity; this was so great that the chest was permanently in a state of more than complete expiration, at least

on the right side, the left being less affected. As usual, the conditions varied in different parts of the chest.

The right pleura was adherent ; there was no dropsy of the chest.

The lungs appeared too substantial ; they were free from structural disease of grave kind.

The larynx and trachea were slightly injected, and with a little frothy mucus.

The pericardium contained four ounces of fluid ; no lymph.

The right side of the heart was very large in proportion ; it contained a black loose clot, not buffed ; the left side also contained black loose clot, in some quantity ; the left ventricle was stronger than natural, though less hypertrophied than the right. The muscular fibre was very hard and deep coloured.

There was moderate dropsy in the peritoneum.

The stomach was in the state usual in heart disease—contracted, injected, and coated with tough mucus.

The gall-bladder was very adherent to the colon by loose adhesions.

The kidneys were very hard, dark, and large ; deeply congested ; there was no primary lesion.

The scrotum was distended and inflamed superficially.

In the remaining two cases the reports of the post-mortem examinations are in many respects imperfect. In each of them there were difficulties in the way of a complete autopsy. Case 2 could not be thoroughly examined because there happened to be three other inspections the same afternoon, and the month being December, the daylight would not last long enough to enable me to carry out my investigations, in all the four cases, so completely as I could have wished. In Case 6 the relations of the patient objected very strongly to any autopsy being made, and it was not thought right to remove the spinal column in the face of their refusal. But although there are these imperfections in the reports of the two cases under consideration, so that the precise character of the spinal affection cannot be stated, yet their value is but slightly if at all impaired for the purpose which I have now in view. Each of them is a striking example of the supervention of dyspnoea and dropsy in a person affected with spinal deformity.

CASE 5.—*Deformed Spine ; Bronchitis ; Dropsy ; Death.*

(Reported by Mr. W. STERICKER.)

Eliza C. C—, æt. 45, unmarried, a servant ; was admitted, under Dr. Pavy, into Petersham Ward, on the 28th November, 1872. She appeared dull and heavy ; the abdomen was enlarged, and in the right groin there was a swelling, hard to the touch, and seeming to cause great pain if pressed. This swelling had been coming on for a fortnight. She could not account for it. There was no tenderness on pressure in the loins ; the urine was of normal sp. gr., containing neither albumen nor sugar ; the patient had pain in the right hypochondriac region ; there was considerable œdema of the feet and legs.

The patient's mother had suffered from some disease of the liver ; her father was healthy ; she herself, when ten years of age, sustained an injury to the spine, for which she had to lay up for two years ; she had been also subject to bilious attacks and had had jaundice.

She was ordered, on admission, Tinct. Ferri, Tinct. Hyosciam. and Aq. Camph., and on the 2nd December her pain was less and her groin not so œdematous. Urine sp. gr. 1020.

December 3rd.—Her cough was very troublesome, preventing her from sleeping. Wheezing and various loud rhonchi were evident in her right lung, over the greater part of the anterior surface.

4th.—The swelling in groin was subsiding, and the pitting was very slight on pressure.

6th.—Loud cooings and rhonchi were heard over the greater part of the right lung. There was some dyspnoea and a troublesome cough ; the sputum was very slight. An angular curvature of spine was very marked. She presented general congestion of the cervical veins, the external jugular being very prominent, with dilatation about the valves.

10th.—There was a slight amount of albumen in urine, which was of sp. gr. 1022. The œdema in the right leg had slightly increased.

12th.—The amount of albumen had increased, but the bronchitis was less evident.

16th.—The albumen was slightly increasing in amount, and the œdema in the lower extremities and loins was greater; the patient also seemed in a more drowsy state.

About 5 o'clock in the afternoon she was drinking her tea, when it was suddenly all spilt, and loss of both motion and sensation on the right side became pronounced; the mouth was drawn, and the eyelid dropped upon the same side; the left side was affected with twitchings and there was extreme restlessness; brandy was administered; insensibility, however, remained until death supervened at 10 p.m.

The post-mortem examination was made by Dr. Fagge.

The brain was healthy, nothing being seen to account for the paralysis; the vessels were gorged with blood.

The spine was extremely distorted; the bodies of the upper dorsal vertebræ formed an acute angle; below this there was much lateral twisting of the column; this naturally led to twisting of the ribs; these passed downwards with but very little arching outwards, so that they were only about three inches distant from the anterior surface of the bodies of the vertebræ; the lines of the ribs were also irregular; the eleventh was on a plane much internal to the tenth on the right side, and had so produced a deep dent in the liver.

The curvature in the spine made the lumbar vertebræ appear much higher in relation to the ribs than usual.

The lungs did not seem to be emphysematous.

The heart weighed twelve ounces.

The right auricle was enormously dilated, filled with black coagulum and hypertrophied, its wall standing up when emptied; the ventricle was also hypertrophied, crisp, and rigid; the pulmonary artery was as thick as the aorta. On the left side the mitral valve, the ventricle, and the aortic valves were all healthy.

The kidneys seemed firm and hard; their tissue appeared good; but their surface was granular and uneven.

CASE 6.—*Deformed Chest; Bronchitis and Emphysema; Death.*

(Reported by Mr. THOS. CARTER.)

James C—, a French polisher, aged 29, was admitted into Bright Ward on the 22nd November, 1871, under Dr. Wilks,

He had always been subject to a cough since a boy ; he did not remember having whooping cough, but once spat up half a pint of blood, when he was very ill ; he had inflammation of the bowels and typhus fever when twelve years old. He had never been married. His father was asthmatical, and sixty-four years of age. His mother died soon after a confinement. On admission, he complained of shortness of breath, and a cough. His pulse was 108. Resp. 31, temp. 98°.

He sat up in bed with his head and shoulders raised ; his expression was anxious, lips livid, blush on his cheeks ; he was sweating freely ; his nails were curved, and his left hand and both ankles were cedematous. His pulse was 108, small, compressible ; the artery rather rigid.

His chest was small, unsymmetrical ; his sternum was very prominent below, the lower ribs were flattened at the side, and sloped very obliquely downwards and forwards, especially on the right side, making the right side of the chest more prominent, but narrower than the other.

There was fine crackling generally with inspiration and expiration, the latter accompanied by wheezing, filling up the interval till the next inspiration. The upper parts of the lungs filled pretty well, but the lower ribs were drawn in by the action of the diaphragm. He had a frequent cough, and frothy thin muco-purulent expectoration in considerable quantity.

The soft palate was deeply cleft, the hard palate was narrow and arched, and the tonsils were enlarged. The tongue was livid at the edges with thick white tenacious fur.

The heart's sounds were normal, but dulness was limited to a small part near the apex. The bowels were relaxed, and the motions liquid. The urine was thick, there was a deposit of urates, but no albumen.

November 30th.—The bowels were more regular, and the cough less frequent ; there was much less mucus in the bronchi and the sounds were not so moist ; there was wheezing with the expiration lasting till the next inspiration ; a blister had been placed upon the chest.

December 2nd.—Pulse 88, resp. 34. Great relief resulted from the application of the blister, the cough being much less frequent.

4th.—He vomited a good deal.

6th.—He had much less cough, and very little expectoration, there were no mucous râles in his chest.

9th.—The patient had an attack of dyspnœa, a poultice was placed on his chest. He had a good deal of mucus in the tubes, giving moist râles with inspiration. His expectoration had increased. Pulse 90, resp. 30.

11th.—He felt very low; he had eaten nothing but arrowroot. His countenance and lips had become more livid, and his expectoration was not so profuse. Pulse 92, temp. 98°, resp. 78.

14th.—He was much more comfortable; his face and lips was much less blue, and he got his breath better.

22nd.—He had another attack of dyspnœa, his expectoration was very viscid, and got up with difficulty. He became very low, being unable to take any nourishment, and died on the 26th.

The post-mortem examination was made by Dr. Fagge.

When the chest was opened, the antero-posterior diameter was seen to be greatly increased. The spine in the dorsal region formed a deep hollow, concave forwards; the lateral regions of the chest were much flattened, but the hollows on either side of the spine appeared deeper than natural. The lower ribs inclined downwards, so as to come very near the crest of the ilium, especially on the right side. The costal cartilages were very unsymmetrical, the right being more prominent, in fact, projecting above the level of the sternum. The lumbar vertebræ projected forwards, so that their anterior surface was not very far from the ensiform cartilage.

Likewise the cervical vertebræ seemed to have their bodies abnormally near the upper end of the sternum, so that the entrance of the chest appeared unusually small.

The lungs were very emphysematous, their apices, their anterior edges, and their bases being especially so. This condition was not so extreme as is sometimes met with, but it was very considerable; there were some adhesions between the lobes of the left lung near the heart. There was no trace of tubercle. The right base posteriorly was airless and congested. There was no proof of an ancient collapse causing the emphysema.

The airtubes in the lower parts of the lungs were dilated,

but there was no thickening of their walls, they seemed not to contain much secretion. The bronchial glands were rather large and greatly pigmented, being quite black on section, whereas the lung contained but little pigment.

The trachea was flattened laterally, the sacculi laryngis not dilated.

There was some rather recent pericarditis; lymph, especially about the right auricle, in small quantity; a good deal of turbid fluid.

The heart weighed fifteen ounces. It was exceedingly rounded, the right ventricle forming the apex. The right auricle and appendix were both greatly enlarged, much larger than the left. The tricuspid valve would have allowed seven or eight fingers. The pulmonary artery was only slightly thinner than the aorta.

The right ventricle was dilated and hypertrophied, with tough walls; it contained coagulum, as did also the auricle.

The liver weighed forty-one ounces; there was congestion of the hepatic venous system.

The spleen weighed eight ounces; it was firm.

The kidneys were much congested, but otherwise healthy.

CASES OF

ABSCCESS WITHIN THE UPPER PART OF
THE ABDOMEN.

BY C. HILTON FAGGE, M.D.

WITHIN the last few years I have from time to time had occasion to observe, whether in the wards of the hospital, or in the post-mortem room, cases of abscess within the upper part of the abdomen, not confined to the interior of any one organ. Such cases often present features of great interest, in regard both to their diagnosis and to their treatment. But I think that they have been somewhat neglected by writers. They do not yield specimens which can be shown to advantage at the Pathological Society. They are, comparatively speaking, infrequent; and their symptoms and course are so variable that the publication of isolated instances might well appear likely to be of but little service in facilitating their recognition by other observers, or in gaining for them a place in systematic works on medicine. Still I have often thought that it would be well worth while to put together a series of such cases from our pathological and clinical records. Such a collection might be expected to yield more than one group of similar cases, and would form a kind of nucleus, on which further clinical observations might be accumulated. But even if this hope should be disappointed, and the result should be merely a number of separate cases, each one

different from all the others, the series could hardly be altogether useless, since it must necessarily suggest to the mind of every reader the important fact that in practice the upper regions of the abdomen may be found affected with other diseases besides those which are ordinarily enumerated under the heading of diagnosis in a treatise on medicine.

Thus, having recently had occasion to search with another object our post-mortem records (which have now been regularly kept for just twenty years) I took the opportunity of jotting down notes of all the cases, of the kind to which I have referred, that have presented themselves in the pathological department during this period. To them I have added certain other cases that have come under my care in the wards, or that had occurred while I performed the duties of Medical Registrar. The result is a series of sixteen cases, which appear to be sufficient to afford a basis for comparison and inference.

My cases seem naturally to divide themselves into two groups—(1) those in which the abscess is situated in the right hypochondrium, lying between the liver and the diaphragm, and (2) those in which the affected region is the left hypochondrium, the matter having formed in a cavity bounded by the spleen, the stomach, and the diaphragm.

I.—The cases to which I shall first refer,—those in which the pus lies between the liver and the diaphragm,—are in many respects very similar to cases of hepatic abscess, for which indeed they are generally mistaken during the life of the patient. But their causes are very different, when these can be traced. Sub-diaphragmatic abscesses generally result either from direct external injury, or by extension from some disease in one of the neighbouring organs. It must be very important to distinguish such abscesses as early as possible from those which occupy the interior of the liver, and to evacuate the pus as soon as fluctuation can be detected. For their roof is formed only by the diaphragm, which can offer no resistance to the pressure of the pus, and which is thus very liable to perforation, an occurrence almost certain to set up a fatal pleurisy. On the other hand, if early relief be afforded, I think there is reason to hope that the issue would be far more favourable in a case of this kind than in one of hepatic

abscess of the same dimensions. The walls of a sub-diaphragmatic abscess could be approximated much more easily, and its cavity be obliterated much more quickly than if it were (so to speak) scooped out of a solid organ. For the evacuation of the pus in such a case the aspirator would appear likely to be very useful.

If the remarks made in the previous paragraph are well founded, it may well appear remarkable that all the cases to be related in the present group should have terminated fatally. The explanation probably lies in the fact that sub-diaphragmatic abscesses in the right hypochondrium have almost always been mistaken during life for hepatic abscesses. I have little doubt that it occasionally happens that a case of supposed "abscess of the liver" recovers, when in reality the pus was all along situated outside the liver itself, between it and the diaphragm.

In addition to the cases which follow, a very interesting one, of precisely the same nature, occurred during the past autumn in the Clinical Ward under the care of Dr. F. Taylor, who has promised to publish it in these Reports, and I believe it will follow the present communication.

CASE 1.—Sub-diaphragmatic peritoneal abscess, bursting into the lung and into the pleural cavity.

(Reported by Mr. J. JONES.)

W. T—, æt. 38, admitted into Stephen Ward, under the care of Dr. Wilks, June 13th, 1868.

He stated that for the last three months he had been troubled with indigestion and with pain in the chest and in the back between the shoulders. He had sometimes had vomiting in the morning. His bowels had all along been regular.

Three days before admission, while moving a bed, he was suddenly seized with violent pain in his abdomen, and with cramps. The pain caused him to roll on the floor. He vomited a greenish yellow fluid. The pain and vomiting continued up to the time of his admission.

On admission, he complained of severe pain all over the abdomen, increased by pressure. Mr. Stocker saw him, and

ordered warm fomentations, and an enema of soap and water. He complained of thirst. His pulse was 75. The chest sounds were normal. The urine was high coloured, slightly albuminous, and of sp. gr. 1024.

On the 14th Mr. Stocker ordered him mj of croton oil.

15th.—Patient's bowels have been freely opened. The vomiting is much better. He has only vomited once this morning. The pain is now located just over the hepatic flexure of the colon; it is slightly increased by pressure. He is able to lie on his back with the legs extended, and to bear the weight of the bed clothes.

17th.—The patient still complains of pain, which is increased on pressure, at the hepatic flexure of the colon. He says it is no better. Ordered Pil. Opii gr. $\frac{1}{2}$, t. d.; Cataplasma Lini to the abdomen.

20th.—The pain is no better. It extends to the lumbar region behind.

22nd.—When he takes a deep breath, he complains of a dull pain in the back, just below the right scapula. There is considerable effusion in the base of the right chest, evidenced by dulness, as high as the spine of the scapula, loss of tactile vibration, distant bronchial breathing, and ægophony. His breath is short, and he has slight cough, with scanty expectoration. Pulse 94. Ordered Pil. Hydrarg. gr. ij , Pulv. Opii gr. ss, in pil. t. d. Potass. Iodid. gr. ijj , Pot. Acet. gr. x, ex Aq. Camph. t. d. Emp. Lytt. lat. dextro.

After this he improved gradually until July 3rd. The vesicular murmur gradually returned at the base of the lung.

July 4th.—He had several rigors last night, and woke this morning with a profuse sweat. Pulse 95. His breath has a sweet nauseous smell. His liver is pushed down. There is a splashing sound heard on succussion at the right base.

6th.—Yesterday he had several rigors, which were very like ague fits. Ordered Morph. Acet. gr. $\frac{1}{3}$, subcutaneously; Mist. Effervescens.

Pulse 100, small and compressible; resp. 34. There is tympanitic resonance over the greater part of the right chest.

7th.—The patient is worse; pulse 108; resp. 36. He had rigors this morning at about 10 a.m. Breathing is laboured. The urine contains no albumen; its sp. gr. is 1022.

After this he remained free from rigors until the 11th, when slight shivering occurred.

On the 14th he died, rather suddenly.

The post-mortem examination was made by Dr. Moxon.

On putting a trochar into the chest, gas rushed out so violently as to blow out a candle; it was extremely offensive, but could not have been in great quantity, because, whereas the puncture was made near the sternum (the body lying on the back) the liquid came through the tube when the puff of air had gone off. Three and a half pints of liquid were in the right pleural cavity; it was a greyish puriform thin fluid. The pleura was generally rather sodden looking, and patched over rather closely with opaque adherent lymph, $\frac{1}{8}$ in. thick.

Below the diaphragm was a very large abscess, which had pressed down the right lobe of the liver, and caused it to be concave upwards. The diaphragm at the summit, or rather in front of the summit of its right side, was penetrated at two places. One of the apertures was large, and from this site below, there ran a fistula obliquely upwards into a sloughy cavity in the pulmonary substance. This cavity was large enough to contain a hazel nut; its wall shreddy with sloughed lung, and this shreddy part bounded externally by an opaque abscess-wall, or line of demarcation. There also ran a straight passage into the pleura. Thus the pulmonary slough communicated with the pleural cavity by the abscess below the diaphragm which opened into either. Another perforation of the diaphragm ran to the space between the lung and the diaphragm, which was shut off from the rest of the pleural cavity by adhesion of the edge of the lung to the diaphragm. There were other sloughs of the lung communicating by pores in the sloughy pleura with this subpulmonary space. The abscess was at first viewed as hepatic; but it subsequently appeared that this was not the case, for, firstly, in the part that was bounded by liver there were no large vessels running to the wall at all points; on the contrary, the vessels broke up finely towards the abscess as towards the natural surface; and, secondly, the hinder boundary of the abscess was plainly laid upon the outside of the liver, whose face it sloped to meet.

The aorta was very bad ; softish cartilaginous thickening much defaced it.

There was but little to attract notice about the state of the larynx, but over the inner face of the right arytaenoid cartilage there was swelling ; and in the middle of this a minute hole, such as would admit a probe. On pressing over this, there came from it a caseous dryish pus. When the little cavity was opened up, it was found that a curdy pus surrounded the arytaenoid cartilage, and separated it at nearly all points from the surrounding structures. The cartilage was not ossified ; the other arytaenoid was healthy ; the rest of the cartilages were healthy.

The stomach was dark red internally.

The duodenum was deep red, and with its mucous membrane swollen ; the villi were pigmented to a notable extent.

The redness was noticeable throughout the ileum, and also in the proximal three quarters of the colon. The lower quarter of the colon, and the rectum were deep red and swollen ; and at one part lymph or diphtheritic membrane was adherent over a surface equal to that of a sixpence, proving the really inflammatory nature of the redness.

The upper surface of the right lobe of the liver formed part of the abscess wall, as in the preceding description ; the left lobe was much hypertrophied, weighing twenty-six ounces, and rather fatty.

The gall-bladder contained three drachms of grumous yellow bile.

It is expressly stated that this man had not ever been out of England, and that he had not had dysentery. The inflammation of the intestine found after death was evidently of quite recent origin.

The only cause to which the original formation of the abscess can be attributed was his having strained himself in moving a bed three days before admission. It is interesting to notice that he appears to have had no rigors until about ten days before his death, at which time we may suppose it probable that some adhesion gave way, which had previously glued the inflamed and sloughy base of the lung to the diaphragm, so that pus then escaped into the pleural cavity from the subdiaphragmatic abscess, and air from the lung.

In respect of their etiology, it is interesting to compare with the case already recorded the two following, in each of which an abscess existed, having precisely the same seat as in the first case, but in both it was distinctly traceable to an injury.

CASE 2.—*Peritoneal Abscess from blow; Pleurisy; Pericarditis.*

C. T—, æt. 10, was admitted September 17, 1858, having received a blow on the abdomen two or three days before admission. He was suffering from pain and swelling over the region of the liver. After the acute symptoms had passed off, it was found that the chest was involved, and that pleuritic effusion existed on the right side; but it was said that he was not then acutely ill, and that he became so only ten days before his death.

The post-mortem examination was made by Dr. Wilks. There were no external marks of injury.

The right side of the chest was quite full of pus, so that it escaped on the first puncture; the lung was compressed towards the spine, collapsed and carnified; its tissue healthy.

The suppuration extended along the mediastinal glands to the left side; there was universal recent pleurisy of the surface of the left lung, which was adherent to the chest. This was probably of not many hours' standing.

There was acute pericarditis; the surfaces adherent, but easily separable; granular lymph covered every part of the heart.

On opening the abdomen, the cæcum was found adherent to the parietes, as also a coil of ileum below it. The adhesion here was firm, and evidently as old as the injury; on tearing it away some purulent matter was found between the two portions of bowel, but their walls were intact.

The liver was firmly adherent to the diaphragm above, and in the first attempt to separate the adhesions, a large quantity of pus escaped, amounting to about a pint. This formed a hollow in the liver, as if the abscess had been within its capsule; but on further examination it appeared clearly that

it was altogether outside this viscus, and wholly in the peritoneal cavity.

The diaphragm was sound, there being no communication between this abscess and the one in the chest.

The liver beneath the abscess was healthy, but its capsule at that part was thickened.

CASE 3.—Injury to the Liver ; Peritoneal Abscess.

E. C—, æt. 22, was admitted on September 6th, 1864, into Stephen Ward under the care of Dr. Wilks. About three weeks before admission this man had fallen across a joist, striking his side and abdomen; it was thought at the time that he might have ruptured his liver; he was attended at his private house, and afterwards brought to the hospital. He was then suffering from immense distension of the abdomen, and partial obstruction of the intestines. After injection there was some relief, and it was thought he might recover. However he gradually sank.

The post-mortem examination was made by Dr. Wilks. The right lung was pushed upwards by the diaphragm; its base was firmly adherent, and about this there was some recent pleurisy. When the lung was removed it was found that the diaphragm was perforated; the hole communicating with an abscess below the diaphragm.

All the intestines were firmly united by lymph of a black colour; this, no doubt, being due to effused blood. There was no especial contraction found in any part.

The diaphragm was firmly united to the liver, and, on separating them, a large abscess was opened which lay between them and involved the surface of the organ itself. The right lobe of the liver had been lacerated, and some blood and bile had been effused.

The next case is very similar in many respects to the preceding ones; but it differs in its causation, the starting point having been a cancerous tumour of the pylorus.

CASE 4.—Cancer of Pylorus ; Abscess in right Hypochondrium ; Pleurisy and Peritonitis.

G. N—, æt. 45, was admitted into Stephen Ward, under the care of Dr. Gull. There is no complete history of the case, but it is stated that he had been in the clinical ward some twelve months before, with a tumour in the abdomen, which he said moved about. On the present occasion he suffered rigors. There was dulness at the base of the right side of the thorax.

The post-mortem examination was made by Dr. Moxon. The right pleura was covered on its postero-infero-lateral face for two thirds its depth, with a thick layer (half an inch) of honeycomb-like yellow lymph, having a little fluid in its interstices. The inflamed part of the pleura was sharply defined by an irregular edge above and below ; it reached the diaphragm, where the lung was firmly fixed by old adhesions ; there was a distinct patch of lymph on the pericardial face of the pleura. The lymph was laminated and adherent to the pleura. The lungs appeared natural throughout.

The peritoneum was inflamed, especially on the right side, and lower down, where there was a fair quantity of very recent lymph.

On opening the abdomen, the aspect of the viscera was natural, except for the peritonitis above mentioned, but only the left lobe of the liver was visible, all the contents of the right hypochondrium being hidden by the firm wall of what proved to be an abscess. The lower limits of this were determined by an extended adhesion of the pyloric end of the stomach to the fore wall of the abdomen.

The abscess was bounded behind by the liver, and the pyloric end of the stomach ; the liver was thrust back by it, the abscess going up upon its convex surface over about three or four square inches of its middle part, but not invading its substance, which was protected by thickening of the capsule. Above it was bounded by the diaphragm, and in front by the anterior parietes ; towards the left the falciform ligament had limited or aided in limiting it.

When the abscess was opened, it was found to be full of pus of a yellow colour ; when this was removed the lower and hinder

part was found to be full of nodular growths of encephaloid cancer, the growths spreading along the pyogenic membrane within the abscess, and starting from round the pylorus where the cancer had evidently taken its rise, and where the abscess rested directly on the stomach.

There was a perforation of the stomach on the antero-superior face of its lesser curvature; the hole would allow the handle of a scalpel to pass freely, its edges were slightly thickened and were firm; through this hole there was direct communication between the abscess and the stomach; it was elongated in the line of the lesser curvature and narrow across. The cancer crept over the liver and gall bladder, and on to the diaphragm along the lining membrane of the abscess, whilst the firm white fibrous wall of the same escaped.

The interior of the stomach at the pyloric end showed many ulcers, whose floors were cancerous. At the upper part of the pylorus, towards the liver, the mucous membrane was entirely destroyed over two square inches. The perforation was to the left of the mass of cancer, and was not involved in the cancer. The muscular coat of the stomach near its pyloric end was much hypertrophied. Several of the lymphatic glands about the pylorus were cancerous, but not to a great extent.

The following case is very similar to those already recorded, except that the abscess was on the convex surface of the *left* lobe of the liver; and that there was a perforation through the diaphragm, leading into the left pleura. One is therefore tempted to believe that it was of the same nature as the others. It would appear, however, that Dr. Moxon, who conducted the post-mortem examination, regarded the case rather as one of empyema, penetrating the diaphragm downwards, and making its way into the abdomen. His main reasons for taking this view seem to have been the circumstances that the aperture through the diaphragm was wider on its pleural than on its peritoneal aspect; and that the floor of the pleural cavity also presented some other small excavations, which penetrated to the subserous tissue. He also thought that the old adhesions of the lung to the diaphragm had fixed it, so as to favour its perforation.

CASE 5.—*Empyema; Pericarditis; Perforation of the Diaphragm; Sub-diaphragmatic Abscess, invading the Liver.*

S. T—, æt. 39, admitted into Philip Ward, under the care of Dr. Habershon, in 1865. No history could be obtained of his state previous to admission.

Paracentesis thoracis was performed, as the man seemed to be dying of suffocation from the quantity of liquid in his chest.

The post-mortem examination was made by Dr. Moxon.

The *right* pleura contained three pints of turbid fluid; the membrane was dull, but had no adherent lymph. There were general minute ecchymotic patches over its hinder and lower part.

The *left* pleural cavity was lined by a thick layer of firm membrane which could be separated from the pleura, by tearing a more lax and delicate layer that joined it to the pleura. The interlobular fissure had its pleural surfaces free, so that the space between the lobes would open freely.

The lung was adherent to the containing cavity superiorly and supero-internally by adhesions antecedent to the fatal empyema; it was also very firmly adherent to the diaphragm, towards the middle of the chest and behind the perforation in the diaphragm. In consequence of these adhesions, the lung was stretched vertically from the diaphragm to the top of the thoracic cavity, forming a mass three inches in diameter, and the middle of the diaphragm was held up and prevented from being pushed down by the effusion. The lung so stretched was adherent towards the middle line by its whole length. Its texture was perfectly healthy to all appearance, but completely devoid of air; its colour darkish, and its section perfectly dry.

An inch and a half behind the juncture of the seventh and eighth cartilages was a hole in the diaphragm, the size of a sixpenny piece, which was bevelled, so as to be considerably wider towards the chest than towards the abdomen. It penetrated the muscular substance of the diaphragm very close to the pericardium.

In the thick pleura near the above-described hole were many crooked-looking excavations; some of these passed through the pleura itself, and came upon the connective tissue, between the two serous sacs about the front of the diaphragm.

The pericardium was closed by adhesions which gave way to firm pressure or tearing; these were in greatest quantity towards the left and lower angle of the pericardial sac.

The whole heart was displaced *upwards* and to the right side, so that the apex was opposite the junction of the body of the sternum with the ensiform cartilage, and the left edge of the heart fell to the right of the middle plane.

On clearing away the muscles from the peritoneum an abscess came into view, touching the epigastrium for the breadth of about one inch below the xiphoid cartilage, and that of the left 7th rib; all round this abscess the liver was so firmly adherent to the diaphragm that it was for a long time uncertain whether the abscess was under the capsule of the liver or above it; the abscess hollowed the generally convex upper surface of the left lobe of the liver to within an inch and a half of its edges. Careful observation, however, showed that the capsule of the liver was unbroken, save at the middle part of the abscess, where there was a hole in the lower wall of the abscess that brought the contents of the abscess into contact with the liver substance. At this spot there was recent suppuration of the hepatic tissue, for the depth of a quarter of an inch; this was the only suppuration of the liver. The organ was large and was thrust downwards and forwards by the empyema, by the fluid in the right chest, and by the abscess. Its section showed fat, but there was no cirrhosis.

The sub-diaphragmatic abscess communicated with the empyema through the hole in the diaphragm. The contents of both the abscess and the left chest were very fetid; the pus was of a light dirty greenish-yellowish colour.

The stomach was untouched, pale within, with slight injection. The intestines were irregularly injected; there was no ulceration.

The following case ought perhaps not to be placed in association with those hitherto recorded in this paper, for at the time

of the post-mortem examination it appeared probable that the abscess had originally been within the hepatic substance. The man, however, was under my care when first admitted into the hospital; and my impression at that time was that the disease was a blood-cyst in the upper part of the abdomen. For when the tumour was first tapped, the fluid removed appeared to be only altered blood. However, the man had been in India, and had had dysentery some years before; and, reviewing the case now, I cannot but admit the probability that the case was really one of hepatic abscess. For it is well known that in abscess of the liver the matter is sometimes found of a peculiar brick-dust colour, or (to use the words of Frerichs) "reddish brown, chocolate-coloured, or like the lees of wine." But, however this may be, the case appears to me to be well worthy of being placed on record, not only because of the doubt which prevailed as to its real nature, but also because the pus ultimately took a very curious course, in burrowing towards the lumbar region. I shall have further on to relate another very interesting case (Case 9), in which it seemed that the same thing occurred.

CASE 6.—Abscess in the Right Hypochondrium, probably Hepatic, but supposed to be a suppurating blood tumour.

John B—, æt. 38, a farm labourer, but formerly a fireman on board a steamer, and whose family history was good, was admitted into John Ward under Dr. Fagge, on the 29th July, 1868. It appeared that his general health had been good. Seven years ago he had been in India and China for three years, during the last six months of which he had dysentery, and passed blood with his motions; he had no other illness. He was subject to pains about his abdomen for four years, especially after taking anything.

About nine weeks before admission, whilst carrying something, he felt severe pain in his right side; he worked three days and was then laid up for a fortnight; the pain subsided, and he worked a week; he had shivering, and was again laid up. The pain had always been confined to the region of the liver, and he had not been able to lie on his left side. A month later a swelling

began to form in the region of his liver, and increased. His bowels had been regular.

His body was not markedly wasted; he had œdema of the legs; there was slight tremor and prostration; his expression was anxious, and sleep disturbed. There was dulness below the nipple on the right side, anteriorly. The intercostal spaces were not bulging posteriorly; there was dulness transversely below the eighth and ninth ribs. There was ægophony with bronchial breathing at the line of dulness.

In the right hypochondrium there was a large rounded tumour, the dulness over which was continuous with that at the lower part of the chest. It reached down as low as the umbilicus in the mammary line. The heart sounds were natural. Pulse 108. There was slight tenderness on pressure over the tumour. A thrill was communicated from one part to another, and it had an elastic feel. The circumference of the abdomen, three inches below the ensiform appendix, was thirty-six inches. Urine sp. gr. 1022, acid, containing no albumen nor sugar.

August 1st.—Mr. Durham made an exploratory puncture with a fine trocar and canula, and drew off about two ounces of dark red viscid fluid, which was opaque, and had a peculiar odour; it was acid, and showed granular blood-corpuscles. The patient felt relieved after the withdrawal of the fluid.

6th.—Paracentesis was performed by Mr. Durham at a spot about an inch below the ribs, and 100 ounces of a dark cocoa coloured fluid with pus were drawn off.

September 17th.—The cyst had gradually filled to its previous size, and caused great uneasiness. It was again tapped in the old site, and 110 ounces of fluid containing granular corpuscles and pus were drawn off, after which the patient was much relieved.

October 18th.—A rash appeared all over him, with the exception of his face; it itched by night, and was in red patches and raised; he had no pain and no sore throat; by the 26th the rash had disappeared.

November 4th.—He had pain in his right side over the cyst, but was easier again.

12th.—His skin was hot and tongue slightly furred.

16th.—There had been great improvement in his condition

lately; the cyst seemed to have no tendency to increase since it was last tapped; the only pain he had was sometimes when he turned round in bed, just at the seat of puncture. He looked quite another man, and had gained flesh. The prominence of the tumour had greatly diminished; the surface sloped away, and it was only on deep pressure that the limit of it could be felt. The patient left the hospital on the 24th of November.

This man was readmitted into the hospital under Dr. Rees in Philip Ward, on the 6th January, 1869; he had been unable to do any work. Since he left, the pain had recommenced, and the tumour had gradually got larger a week before admission. Some feverishness and fits of shivering came on, and he lost flesh very much.

On admission.—The tumour had not regained its former size, but it was distinctly pointing, an oval, soft, fluctuating projection being felt close to the margin of the ribs, in a vertical line upwards from the anterior superior spine of the ilium. He complained of pain in the region of the liver; he had shortness of breath, and seemed hot and feverish. He was ordered Pil. Doveri, on January 6th, with milk diet, and Julep. Acid. Nit. On the 9th, Pil. Opii gr. j.

January 13th.—Mr. Forster tapped the cyst at the seat of fluctuation. Fifty-five ounces of brick-dust coloured liquid came away, of the consistency and look of anchovy sauce; the last part was thicker, and mixed with much pus. In the last ounce there were some streaks and little clots of blood.

18th.—The wound had been left open, but there was very little discharge.

21st.—A catheter was passed into the wound and left there, but not more than six ounces of pus came through it; there was considerable pain about the part, and he had an anxious expression about his face.

23rd.—About five ounces of fluid came away in twenty-four hours, and he felt a little easier.

February 27th.—The wound was still open, and the discharge had continued to flow in considerable quantities into the poultices which had been applied. He had been ordered eggs, rum, or brandy, and Tr. Ferri, also oysters, and he seemed rather better in health.

March 29th.—The man did not look so well, and felt weaker, the discharge had continued; it was red and offensive, and mixed with air. The dulness extended down about to the level of the umbilicus in the line of the nipple, and within about two inches of the umbilicus. He took little or nothing to eat beyond milk, complaining of nausea, and had sweats as he was falling asleep. Pulse 126. He was ordered at night Sp. Chlorof. with Liq. Morphine ʒss.

April 19th.—The discharge had increased, and he was weaker.

May 22nd.—The patient had felt much stronger during the last three weeks, but had vomited, not having done so for a considerable time previously; the discharge was thick, and smelt badly. Pulse 120; tongue dry; the bowels had been opened twice daily. He was ordered to take Mist. Hæmatoxyli and brandy, fowls, also port.

26th.—He had vomited again on the 23rd. His face was very sallow and waxy; tongue the same. The discharge was more watery, and when this was the case, he suffered more pain than usual.

28th.—He continued in the same condition, but there was considerable soreness at the opening.

June 3rd.—His bowels had been opened three times during the night, and he scarcely slept at all, feeling very faint. Pulse 120. He had no appetite at all; and the discharge was still very great. He was ordered Acid. Sulph. dil. with Inf. Rosæ.

6th.—He had not slept all night, on account of severe throbbing all over the right side. His bowels were still loose, and his weakness was very great.

11th.—The pain had continued, and he now felt sore all over, the throbbing pain having extended all up the left side to the head, and between the shoulders.

12th.—He was scarcely able to move, became much feebler, and died on the 13th, at five a.m. He had been gradually passing into an extremely anæmic condition. His lips were quite pale, his fingers wax-like, and his ankles greatly swollen. He had no hæmorrhage, except that in the discharge, which was still fearfully offensive.

The post-mortem examination was made by Dr. Moxon.

The liver was closely adherent at its right end ; in its right upper and fore part there was an abscess of about four inches by five, surrounded by a very thick capsule of fibroid tissue, two fifths of an inch thick. Outside this was the liver substance for three fifths of its circumference. The other two thirds were closed in by the thickened diaphragm at its costal attachments, on the surface of which was a layer of what appeared to be altered hepatic tissue.

The liver was very readily separable from the thick tissues of old inflammatory formation around it. And when it was so separated, and the surface traced towards the abscess, this surface appeared to continue on over the abscess under the diaphragm, but one could no longer see whether this really was altered hepatic substance. It formed only a thin brown layer, and was very incomplete, so that the cavity of the abscess led out by a wide opening into another cavity outside, which went backwards and downwards, reaching the site of the right supra-renal capsule. The walls of the cavity were old, being of such age as would correspond to several months' disease. It seemed possible that the encysted abscess in the liver had existed for a long time, and that the more recent illness (of twelve months' duration) had supervened upon it. The abscess appeared to be within the liver (rather than outside it, thrusting into it), for the hepatic tissue ran up around it in a way that would with difficulty suit the notion of mere contraction of the liver along with the other portions of the parietes. There was another smaller abscess at about two inches distance from this. It was full of yellow, pasty matter. The large abscess had in it a semi-glutinous, greenish-yellow material ; there was no trace of hydatids or of any recognisable formed materials.

The liver substance was highly lardaceous and anæmic. The left and Spigelian lobes were very large, the right not more than half the proper size.

The gall bladder was small ; it contained two drachms of yellow bile.

The spleen was very lardaceous ; the Malpighian corpuscles only affected.

The intestines and stomach were pale. Iodine brought out slight lardaceous disease.

The kidneys were of a pale colour, but of natural size.

II.—I now pass on to a second group of cases, which are very similar to the first group in some respects, but in which the abscess was seated in the *left* hypochondrium, and was therefore bounded mainly by the stomach and spleen, and tended to penetrate into the left rather than into the right pleural cavity.

And first I will take a very interesting case of this kind, in which complete recovery took place. The patient was admitted into the hospital with a tumour in the left hypochondrium. After a time it was found that this contained air as well as fluid, and then each beat of the heart gave rise to a splashing sound, which could even be heard at a distance. There was at no time any considerable constitutional disturbance. The man was able to be up and about the ward, and after a time left the hospital of his own accord. A little while afterwards he came back and said that he had vomited a quantity of matter, and that the tumour had disappeared. It was found that he was right in this, for there was no longer any abnormal state to be detected in the left hypochondrium either by palpation or by percussion.

CASE 7.—Tumour in the left Hypochondrium ;—Abscess, which communicated with the Stomach, so that air entered it, and each beat of the Heart gave a Splashing Sound ; Ultimate emptying of the Abscess into the Stomach, and cure of the Disease.

(Reported by Mr. R. B. Hogg.)

L. K—, æt. 37, was admitted into Philip Ward, August 23, 1867, under the care of Dr. Fagge, in the absence of Dr. Rees. He is a carman, and enjoyed good health until nine weeks ago, when a man in the Kent Road gave him a kick in the left side. Since then a swelling has formed in the side, and has gradually increased in size ; it is not very painful. All the time he has also suffered more or less from pains in the chest and lower extremities.

He had previously met with several accidents, and once had his left ribs broken. He has a lateral curvature of the spine ; this was caused by another accident eighteen years ago.

He has been in the habit of drinking large quantities of spirits.

On admission.—There is a large rounded tumour in the left hypochondrium, by which the heart is displaced upwards.

He complains of pain across the loins, which prevents his walking any distance. Pulse 80, regular. Tongue covered with a white fur.

August 23rd.—Dr. Fagge saw him in Dr. Rees' absence, and prescribed Mist. Quin. t. d.

26th.—The swelling is no bigger. His general health is very good. Tinct. Iodin. Comp. to be applied to the swelling.

September 4th.—He has brought up more blood from the stomach; a mouthful on two occasions, mixed with a thickish matter-like phlegm.

September 5th.—Again vomited blood; the appetite is improving; but after eating, he usually has vomiting.

7th.—He says he cannot swallow his food and has no appetite. Ordered Acid. Hydrocyan. dil. \mathfrak{mij} , Succ. Conii \mathfrak{mxx} , ex Aq. Calcis t. d.

8th.—He swallows his food well.

21st.—The tumour appears to be smaller than when he came in. Ordered Ferri et Quin. Citrat. gr. v ex aq. t. d.

October 7th.—Dr. Fagge carefully examined him, and made the following notes:—"I do not think there is any decided diminution in the size of the tumour. It appears to be a rounded mass, extending deeply, so that no lower edge to it can be felt.

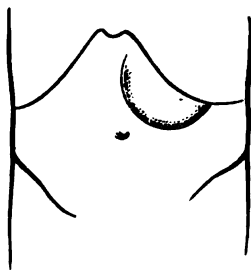


FIG. 1.—Showing the state of the swelling on October 7th.

Its inner border reaches the middle line of the body; and it reaches downwards to within an inch of the umbilicus. It is

perfectly dull on percussion, except along its inner border. Here there is tympanitic resonance, less clear, however, than over the adjacent stomach. The ribs themselves are displaced; the most prominent part of the tumour is, in fact, formed by the edges of the ribs; but this appearance is, doubtless, a result of the former fracture, and in no way due to the pressure of the tumour at the present time. There is good resonance in the axilla down to an inch lower than the nipple.

The heart's impulse cannot be felt below the nipple at all. It is felt above the nipple between the third and fourth ribs, and also above the third rib. On listening to the heart sounds in this position they are found to be perfectly natural. But, below the nipple, very curious gurgling sounds are audible, synchronous with the heart's beats. These were first noticed by Mr. Waddy on the 3rd of October. They can be best heard when the patient is standing up. Even then they are not always audible, and sometimes they appear to cease when he begins to take a deep inspiration. They are of a metallic or musical quality, the systole being often accompanied by several distinct tinkling sounds.

The back of the chest affords no indication of disease. The right side is dull on percussion, but probably this is an effect of the lateral curvature of the spine.

October 20th.—The gurgling sounds can now be heard without the aid of the stethoscope, and even at a distance of three feet from the patient. They are not constant. There is now tympanitic resonance over the tumour, except when he lies on the left side; this causes the disappearance of the tympanitic percussion note. The left lung in front appears to do very little work; behind there is good respiratory murmur.

26th.—Much less gurgling is now audible. The tympanitic sound seems to vanish when he turns upon his right side as well as upon the left. A few days ago, it was persistent when he lay on his right side. The tumour seems to have increased in size; it now reaches to the umbilicus.

On November 6th, he was discharged from the hospital at his own request. He felt well, and would not believe that his disease was anything of consequence. He would not consent to any exploratory operation. He had been up and about the ward almost ever since his admission.

Some time after he left, he came back and said that the

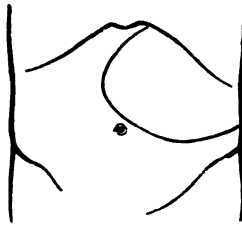


FIG. 2.—Showing the size of the swelling on October 26th.

tumour had suddenly disappeared, having discharged a quantity of matter, which I suppose he must have vomited, although there is no note of the fact in the report. On examination it was found that he was right in stating that the tumour was no longer to be discovered. The man appeared to be quite well, and I believe that nothing has since been heard of him.

Remarks.—When this patient was first admitted into the hospital, his case attracted great interest. I remember showing him to one of my surgical colleagues, who happened to come into the ward to see another case. The question particularly discussed was, whether the tumour was an aneurism. I do not remember that the possibility of its being an abscess was ever suggested, until the peculiar gurgling sounds synchronous with the beats of the heart, and the tympanitic resonance, showed that it had formed a communication with the interior of the stomach. Yet, comparing this case with those which have now to be related, I cannot help thinking that the history and the physical characters of the tumour ought together to have enabled a positive diagnosis to be arrived at. Cases of abscess in the left hypochondrium appear not to be very uncommon, and the tumour seems generally to have the same position and form. According to the reports of the cases that I have had an opportunity of seeing, one must not look for a definite history of rigors, nor of the marked febrile disturbance that might have been expected to attend the formation of so considerable a collection of pus.

I may next take another case, in which, as in that just

related, an abscess in the left hypochondrium was due to a direct injury; but, in this instance, the accident was a very severe one, and there were fractures of the skull, ribs, and pelvis. From these injuries the patient died, and it was then found that the spleen had been lacerated, and that an abscess had formed in the neighbourhood.

CASE 8.—Rupture of Spleen, with Abscess between Liver and Stomach, and about Spleen. Fractured Skull, Pelvis, and Ribs. Pneumonia.

G. W.—, æt. 18, admitted Oct. 13th, 1865, into a surgical ward, having fallen from a scaffold into a barge, and, it was supposed, having struck his spine. The history of the case appended to the report of the post-mortem examination appears to show that attention was chiefly directed to the injuries of the head and of the pelvis. He was going on well until Oct. 26th, when pneumonia set in, and of this he seems to have died.

The post-mortem examination was made by Dr. Moxon.

There was fracture of the left side of the frontal bone, with considerable bruising of the brain.

The eighth and ninth ribs were broken four inches behind their cartilages; the pleura was not torn.

Between the base of the left lung and the diaphragm there was a patch of yellow lymph of the size of the palm of the hand, causing moderate adhesion between them. This patch was opposite the broken ribs. The diaphragm was not perforated.

The left lower lobe of the lung was healthy, and fairly substantial to the grasp; in sections oozing and bright, yet the substance considerably softened. Gentle continued pressure squeezed out the fluid, and the lung would return almost to its ordinary size, but remained then over-lacerable. The right lower lobe was less affected, but in the same way. An irregularly circumscribed patch of the deeper part of the right middle lobe was in a state of early grey hepatization.

The peritoneum had patches of black staining from blood effused beneath it and changed by the intestinal gases; this was the case especially above either ilium.

The great omentum had blood extravasated into its texture,

between its first and second layers, and not in the lesser cavity of the peritoneum. This had come from the spleen by the way of the splenic omentum at the continuity of this with the great omentum.

Between the stomach behind and the liver and diaphragm in front was a large abscess, whose contents were sero-purulent. This abscess was confined by firm yet lacerable adhesions, of a line in thickness. It passed both before and behind the œsophagus into continuity with a ruptured cavity in the upper part of the spleen. There was another line visible in the stomach and liver, concentric with the boundary of the abscess, and indicating that the abscess had formerly been of dimensions limited by that line of adhesion, which had given way and allowed it to spread to its present size. The kidney and suprarenal capsule were thrust downwards and inwards, but escaped invasion.

The liver was healthy.

The lumbar and iliac glands were twice their usual size, and soft.

The left ilium had its ala fractured, the upper part being drawn slightly downwards and inwards.

Remarks.—There appears to be no reason to suppose that in this case the laceration of the spleen and the resulting abscess were in any way concerned in bringing about the fatal issue. The case might have terminated as favorably as Case 7, had no other parts been injured.

The following case is unfortunately incomplete: the patient insisted on leaving the hospital as soon as she could be moved, and on returning to her native country, France.

CASE 9.—*Abdominal Tumour from injury (? effused blood). Subsequent formation of (?) Lumbar and Epigastric Abscess.*

Josephine D—, æt. 31, admitted August 26th, 1868, under the care of Dr. Fagge.

The patient is a Frenchwoman, and stewardess on board one of the Channel steamers. She always enjoyed good health.

On August 15th, she crossed the Channel in a steamer: the sea was very rough, and she was thrown out of her berth upon the cabin floor; she was very sea-sick both before and after she was thrown out of the berth; she brought up some yellow bile afterwards, and had much pain in the left hypogastric and mammary regions; there was also some diarrhœa.

In consequence of her having been admitted in the vacation, no notes were made of any thorough examination of her chest until August 31st. It was then noted that both sides posteriorly were resonant, except at the right base (?). Some bronchitic sounds were audible in this region. In front, at the left base, crepitation was to be heard.

August 27th.—

R. Sp. Æth. Nit. $\mathfrak{m}\mathfrak{x}\mathfrak{v}$;
Vini Ipecac. $\mathfrak{m}\mathfrak{v}$;
Syr. Papav. $\mathfrak{z}\mathfrak{s}\mathfrak{s}$;
Mist. Pot. Nit. 4tis horis.

Emp. Lyttæ 4 × 6.
Milk, beef-tea, brandy $\mathfrak{z}\mathfrak{i}\mathfrak{v}$.

September 1st.—Stup. Terebinth. abd. appl.

Sp. Ammon. Fœtid. $\mathfrak{z}\mathfrak{s}\mathfrak{s}$.
Aque Piment. $\mathfrak{z}\mathfrak{j}$. 6tis horis.

September 1st, 10 p.m.—Resp. 68, pulse 108, temp. 101·6°.

Up to this point the case had been regarded simply as one of bronchitis from exposure during the voyage.

Yesterday afternoon she appeared to be as well as usual, but this morning there is a large tumour in the upper part of the abdomen, situated in the epigastric and both hypochondriac regions. It is resonant on percussion, her breathing is quickened, and the expectoration is the same as before.

There is sibilus over the right lung: no moist sounds. The bowels were open freely this morning.

2nd, 11 a.m.—Resp. 60, pulse 84, temp. 98°. This morning the tumour presents the same appearance, but is dull on percussion; it extends nearly to the umbilicus. She complains of pain, especially at the lower part of the tumour, which pain she says commenced during the night; there was also some eructation; she cannot take the medicine, it made her sick after

taking the first dose. The expectoration is of a brighter red brick-dust colour, and is more phthisical in appearance. Enema Terebinthinæ statim.

The skin is bathed in perspiration.

10 p.m.—Resp. 52, pulse 108, temp. 101·8°. The enema acted well on the lower bowel, but this has had not the least effect upon the tumour.

3rd, 12 a.m.—This morning the tumour is more resonant on percussion than it was yesterday. She still complains of much pain in the left lumbar region, increased by pressure.

10 p.m.—She is worse this evening. Resp. 72, pulse 100, temp. 100·3°. She is in a profuse perspiration, and expectorates bloody mucus. Cataplas. Lini abd. applic.

4th.—This morning she is much less feverish, though the respiration is as high. Resp. 68, pulse 88. The skin is cooler, temp. 96°F. She got very little sleep in the night; her bowels have been freely relieved this morning, the motion being of a semi-solid character and rather light colour. The tumour is less resonant this morning, and rather more prominent, though not extending lower down.

5th.—Mist. Sp. Vin. Gallici, ʒj, 4tis horis. The expectoration still remains bloody, the colour to-day being a brighter red than before, mixed with white frothy expectoration, and less in quantity.

10 p.m.—Resp. 76, pulse 104, temp. 101·6°. She seems feverish again to-night, and the skin is bathed in perspiration.

6th, 11 a.m.—Since the 4th she has been about the same, but to-day she is not so feverish; the expectoration is as before, but contains more blood.

7th.—Omit Sp. Ammon. Foetid.

9th.—Breathing rapid, 58, thoracic. The upper part of the abdomen is still tumid, forming a rounded mass in the epigastrium, nearly as low as the umbilicus. It is dull on percussion, and laterally well defined at the lower edge. There is great tenderness in the left hypochondrium, and in the position of the spleen, and increased resistance. The dulness on percussion is not complete, but rather tympanitic in quality.

The dulness of liver and spleen does not extend unnaturally high. Pulse 88. The expectoration of blood is much less.

11th.—Yesterday she spat no blood at all ; the expectoration was white and frothy and rather viscid ; to-day there is a small amount of blood in the sputum. There is some inflammation and swelling under the left pectoral fascia, causing great pain.

12th.—She spits no blood, and appears quiet this morning. Pulse 80, resp. 68. Pil. Saponis Co. gr. v, in form. supposit. semel in die.

13th, 10 p.m.—This evening there is again expectoration of blood. She brought up a large quantity of bloody mucus all at once this afternoon.

15th.—Expectoration of blood still continues ; otherwise she is in about the same state.

17th, 12 a.m.—Pulse 84, resp. 52. There was expectoration of bloody mucus yesterday and the day before ; there is some to-day. She complains of much pain in the left loin, where the tumour appears to bulge ; there is much pain on pressure ; the pain about the left pectoral muscle is less. Enemata of beef tea to be given b. d., Brandy ℥iv.

October 5th.—She has continued in about the same condition. Pulse 90, resp. 58, temp. 98·8° Fahr.

11th.—Pil. Opii stat.

17th.—Champagne.

20th.—She has continued in nearly the same state since the last report, though sometimes she is in more pain than at other times. To-day she brought up some matter mixed with blood. It was very fetid, and tasted "horrid." There is an inflammatory blush over her left hypochondrium. Poultices (linseed) are applied ; there is much tenderness in that region. Mist. Quinæ.

25th.—She seems much better to-day, *i. e.* she looks more cheerful and is in less pain.

28th.—Brandy ℥ij.

November 2nd.—She lies coiled up in great pain. She groans much, and can take no medicine, for she brings it up ; she cannot take eggs.

4th.—She can take nothing, and brought up two lumps of blood last night. Cough much better. The tumour continues about the same size. Pulse 80, small ; resp. 60, short but quiet ; râles all over chest, skin hot and moist, cold sweats at night ; she has not spat so much blood.

5th.—The present condition of the abdomen is nearly as is represented in the diagram below.

7th.—She has spat up bloody mucus for last three days.

9th.—She vomited up a small quantity of bright red blood

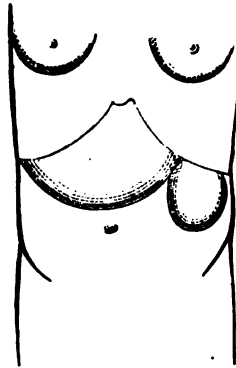


FIG. 3.

When the clinical clerk saw it, it was clotted into the form of the vessel, with a slight sanguineous serum floating above it. Intimately connected with it were several pellets of mucus containing air, and looking as if expectorated, but she says she vomited up the blood. The tumour in the left side is distinctly movable beneath the parietes. Dr. Fagge thought he could feel a notch near its lower end.

10th.—She did not spit blood yesterday or to-day. She was restless in the night, and in much pain.

12th.—Expectoration is frothy, contains blood; resp. 50, very rapid; pain worse. Lin. Belladonnæ ou spongio-piline to abdomen.

13th.—The swelling is smaller; the spleen can be felt nearly as low as the crest of the ilium; pulse 88.

14th, 11 p.m.—About 20 minutes since she was suddenly taken with pain at the hypochondrium, her breathing became laborious, and occasionally stertorous and spasmodic; and she had vomiting, though not to a great extent. She had had the spongio-piline applied at 6 p.m., well soaked in Lin. Belladon., and had been complaining of the smell of it during the evening. The attack was accompanied by much pain about the throat, and she swallowed some brandy and water with difficulty.

This, however, soon gave her relief. The respiration was somewhat similar to that of whooping-cough; there was no dilatation of the pupils, but rather contraction. The pulse was regular, though fainter than usual. She is now more quiet and in less pain, but the respiration is much hurried.

15th.—She has had morphia injection every night, gr. $\frac{1}{2}$, for some time; this is still to be continued. Resp. 62, pulse 82. She has brought up more blood; tongue clean.

17th.—Resp. 36, pulse 92.

18th.—Pain very bad.

20th.—Resp. 52, short and quick. She is nearly voiceless.

22nd.—The accompanying diagram represents the present state of the swelling.

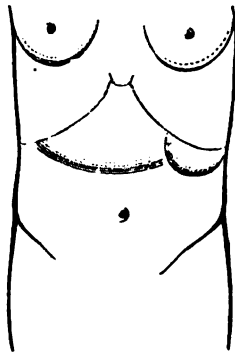


FIG. 4.

23rd.—Pulse 84, full. She has spat no blood for a week.

Rep. Mist., et adde—

Tr. Camph. Co. 3ss;

Brandy, 3iv;

Cataplas. Sinapis.

26th.—She brought up more blood and tenacious mucus; the blood was rather bright red; she coughs first and then retches, and brings it up.

R. Sp. Æth. Nit. mxv;

Syr. Papav. 3ss;

Mist. Pot. Nit., 4tis horis.

30th.—The pain seems less to-day; she speaks louder and breathes more freely. She was sick last night, and brought up

the medicine, &c. She sleeps a little during the day, but says she gets no sleep at all.

December 2nd.—She has spat no blood for two days. She slept well last night; tongue clean, pulse weak. Morph. inject.

8th.—She vomits a small quantity of blood; restless at night, bowels open, pulse 92. Mist. Quiniæ.

9th.—She continues to vomit a small quantity of blood, about 3j in twenty-four hours. The morphia injection relieves the pain, but does not procure sleep.

10th.—Opii, gr. j, h.s. sumend.

11th.—She says the morphia injection procures sleep, and the opium causes her to vomit; she does not seem so drowsy.

13th.—Bowels open; she slept well last night, tongue clean.

January 4th, 1869.—She is in a very weak state, and expectorates blood occasionally.

6th.—About the same.

9th.—Last night she vomited about a tea-cupful of matter of a dark colour mixed with blood, bowels are open regularly every day.

Tongue is clean, but she has a bad taste in her mouth, takes milk, egg, and brandy.

The tumours are in much the same state, but rather larger if anything; that in the left side certainly extends lower than when the former diagrams were made, its edge is less sharp and more resistant.

20th.—She has not brought up any blood lately; the bowels are regular.

February 3rd.—She is not bringing up any blood; she is very weak indeed. Linctus Opiatus, Mist. Quiniæ.

9th.—There are bronchitic sounds all over chest, and a swelling in the left loin, situated on outer side of erector spinæ. She spat up a very little blood yesterday.

15th.—The glands of neck are enlarged, has not spat up any blood for two days.

March 6th.—There has been but little change to report; she lies with the curtains drawn round her, taking but very little notice. I think she has gained rather than lost flesh recently.

There is a soft oval fluctuating swelling in the left loin, which seems as if the original disease had supplicated and was

breaking its way through in this direction. Here there is great pain and tenderness, also some impulse on coughing.

She has a daily rigor about dinner time now.

Three or four days since she brought up a quantity of scarlet blood freely intermingled with bronchitic mucus, very like what she has before shown. It would seem to have been expectorated.

There appears to be no change in the abdominal swelling.

March 11th.—Has brought no more blood up, complains of the rigors still, which come on every day at 12 a.m. and subside at 4 p.m.; pulse 88. P. Mist. Quinæ.

16th.—During the night spat up some blood mixed with froth of a bright colour; does not get any sleep.

17th.—Mr. Goodhart ordered her Vini Ipecac. $\mathfrak{m}\mathfrak{v}$, Tr. Camph. Co. $\mathfrak{m}\mathfrak{x}$, ex Mist. Oxymellis, $\mathfrak{z}\mathfrak{j}$, p. r. n. She complains of pain in her left side; her cough is troublesome this morning; still has a morphia injection at night, but does not get much sleep, though it eases the pain.

27th.—She remains in about the same condition as when the last note was made, has brought up a little blood since. P. Mist.

30th.—Yesterday evening she brought up a good deal of blood; she says the injection lessens the pain, but does not procure her any sleep.

April 18th.—She brought up a good deal of blood last night, and is still bringing up a small quantity: last night she brought up some large black lumps of blood as thick as two fingers. Felt greatly relieved when she had brought it up.

24th.—Has been spitting up a good deal of blood this morning, but does not feel much relief from it.

May 4th.—The chief change in the tumours recently has been a slow increase in size. The whole upper part of the abdomen is now occupied by a rounded tense mass, causing a prominence of the epigastrium and sinking gradually about the umbilicus; it reaches lower than in either of the diagrams. There is a general hardness in the left side, reaching down to the left crista ilii, but no edge like that of the spleen can now be felt, such as was formerly made out. It is remarkable that the mass in the epigastrium is not now universally dull; on the contrary, an imperfect tympanitic note is obtained to the right of the umbilicus over this rounded swelling.

The mass in the loin remains unaltered, but I think is less

soft than it was; there is not so much tenderness as formerly; she has gained flesh lately and can sit up, and can walk to the closet.

8th.—She insisted on leaving the hospital and returning to her native country.

Since then I believe that nothing has ever been heard of her. I gave her a letter for any French medical man under whose care she might come, in which I asked for information about the issue of her case, but no news of her has ever reached me.

Remarks.—It may be imagined that during the eight months which this patient passed in the hospital her case excited great interest. At first she was exceedingly ill, so ill that her death was expected from day to day. For a long time she lay with the bed curtains drawn round her, most unwilling to be disturbed in any way, and grudging even the interruption to her quiet caused by the visits of her medical attendants. The slightest hint at the advisability of an exploratory puncture made her urgently request to be allowed to leave the hospital. And as soon as she began to gain strength, she insisted on going home.

When the tumour in the abdomen was first noticed, five days after her admission, all kinds of guesses were propounded as to its nature. One opinion, I remember, was that it was some rapidly growing malignant tumour. But the view which then appeared to me most probable, and to which I still adhere, was that it consisted of extravasated blood, the hæmorrhage having taken place secondarily to some local injury received during the rough voyage to which she referred the commencement of her illness. Adopting this view of the case, I think it is quite possible that the tumour really began to form during the night of the 31st of August, just before it was discovered. But it is much more likely that its formation was gradual, and that it escaped notice until it had reached a certain size. The possibility of this must, I think, be admitted when it is remembered that in Case 8 the existence of an abscess in the left hypochondrium appears to have been entirely unsuspected during the patient's lifetime. The supposition that the swelling in Case 9 first arose gradually, also accords better with its gradual progress afterwards, indicated by the change in the percussion

note, which was at first tympanitic over the tumour, and did not become dull until the following day.

In Case 9, the position of the swelling was not quite the same, as in the other cases which we are now considering. It occupied the epigastric, rather than either of the hypochondriac regions. In connection with this fact, I may mention that I have seen more than one patient who has presented a tumour in this position, the nature of which has remained entirely obscure. There has been in the epigastrium a rather hard swelling or fulness, the lower border of which has been rounded, without any edge, and inclining upwards and outwards symmetrically on each side to meet the rib-cartilages. There have been no definite symptoms indicating that there was any local disease of serious importance, and the complaint has shown no tendency to terminate fatally. Is it possible that in these cases the swelling has consisted only of an accumulation of blood, effused into the upper part of the abdominal cavity and coagulated there? I have no accurate notes as to the results of percussion in the cases to which I am referring; but I well remember that in one of them the note was of a doubtful character, half tympanitic, and half dull;—just such a note as one might expect to obtain if a layer of coagulated blood were to intervene between the parietes and the stomach beneath;—just such a note as is spoken of as having been observed in Case 9, at one period of the case.

It may be asked whether the tumour in Case 9 may not have been from the first simply an abscess, such as appears to have existed in both Cases 7 and 8. But it seems to me that its development was too rapid to admit of such an hypothesis as to its nature, even if we suppose that it began to form as soon as the patient had received the injury that seems clearly to have been its starting point. I must, however, confess that I feel quite uncertain how much of the subsequent increase of the swelling was due to further effusion of blood, and how much to the occurrence of suppuration. That pus was ultimately formed is, I think, evident, not only from the fact that distinct fluctuation existed in the left loin, but also from the recurring rigors which the patient experienced towards the end of her stay in the hospital. The only remaining feature of the case that appears to need a word of comment is the circumstance that she expec-

torated blood week after week, part of which seemed to come from the lungs and part from the stomach. I think that there can be little doubt that that portion of the blood which was vomited was effused by the vessels of the stomach, which may well have been greatly congested in consequence of the pressure of the swelling upon the efferent veins of the organ.

The following case differs from those hitherto recorded in this series, in not having been traceable to any external injury. It thus bears very nearly the same relation to Cases 7, 8, and 9, that Case 1 bears to Cases 2 and 3.

CASE 10.—Subdiaphragmatic Abscess, occupying the Left Hypochondrium and penetrating the Left Pleura.

R. I., æt. 26, was admitted January 6th, 1858, into Job Ward, under the care of Dr. Hughes. He had been quite well until seven weeks before, when one night he was suddenly seized with violent pain in the abdomen, accompanied by vomiting and purging. He was able to walk to a doctor's the next day, but the symptoms continued, though with less severity; and he has been getting worse ever since.

On admission the man was very ill, but his case was very obscure. The abdomen was tumid, the skin hot, &c., as in the termination of typhoid fever. The absence, however, of such a history prevented any diagnosis being made beyond one of "chronic peritoneal disease."

The post-mortem examination was made by Dr. Wilks.

The left lung was pushed upwards, and at its base adherent to the diaphragm. When this was removed the surface was seen to form part of an abscess, which had made its way from the abdomen through the diaphragm.

The surface merely of the lung was involved; the corresponding part of the diaphragm was destroyed, and through this the hand could be passed into the abdominal abscess below.

The abscess into which the hand passed from the chest was situated in the peritoneal space in the left hypochondriac region; the surface of the spleen, and the left lobe of the liver, together with the diaphragm, forming its walls.

The matter contained within it was well-formed ordinary pus,

without odour. The neighbouring organs were carefully examined in order to see if disease in any one of them had originated the formation of the abscess, but nothing satisfactory could be determined. Their surfaces, besides being adherent to the surrounding parts, were involved in the abscess, and so were necessarily softened. It was consequently difficult to ascertain whether there had been any previous mischief.

The stomach on its mucous surface was healthy. The duodenum, colon, &c., were all firmly matted together, and numerous ruptures were made in disconnecting them, but no positively diseased structure could be seen.

All the intestines were firmly united together, and these to the abdominal walls. No ulceration was found in the parts examined.

Dr. Wilks concludes his report by remarking—"It would appear as if a general peritonitis had existed, and in one part of the abdominal cavity a circumscribed inflammation ending in abscess, but whether this inflammation was idiopathic or from some local cause it was difficult to say. In all probability the latter was the case, although it remained undiscovered."

The following case resembles that just related very closely, as far as the existence of an abscess in the left hypochondrium is concerned communicating with the left pleura through the diaphragm. In this case, however, there appears to be little doubt that the abscess was the result of a general peritonitis, which had itself been set up, not by any disease in the upper part of the abdomen, but by parturition. So far as it goes, therefore, this case tends to confirm the former of the two hypotheses suggested by Dr. Wilks in the previous paragraph, in explanation of the abscess in Case 10.

CASE 11.—Subdiaphragmatic Abscess occupying the left Hypochondrium, and perforating the left Pleura; itself resulting from a general Puerperal Peritonitis.

A. Y—, æt. 25, admitted February 14th, 1865, into Lydia Ward, under care of Dr. Barlow. The history of the case was involved in some obscurity; but it was learned that she had

been delivered of a child about five weeks before. It was therefore thought probable that the peritonitis from which she suffered was due to some pelvic inflammation, in connection with that event. After the symptoms of peritonitis had existed for some time, a discharge took place from the umbilicus, which was of a milky or purulent character, and very offensive.

The post-mortem examination was made by Dr. Wilks.

The ribs were not fractured, nor was any other sign of injury found.

There was pleurisy on the left side ; the surface of the lung was covered with brownish lymph, having rather a fetid odour. On removing the lung, the pleura was seen to communicate with an abscess near the spleen by means of a sloughing opening in the diaphragm.

The lung itself was hepatized throughout, but not uniformly ; scattered masses of hepatized tissue being found throughout the lung, some of them softening.

The right lung also was softening.

There was a small opening admitting a probe at the umbilicus. There had been a general chronic peritonitis, all parts of the intestines being closely matted together, as well as the stomach to the liver, the liver to the diaphragm, &c. The omentum completely covered the intestines, so that these were not visible ; there was no fluid seen in the abdomen until the parts were separated ; the abdominal walls were not adherent.

Immediately beneath the umbilicus was the pyloric end of the stomach, and on its anterior surface towards this end was a small round opening which would have admitted a crow-quill. The edges of this were smooth and round, showing no evidence of chronic inflammation, nor having the appearance of an artificial or accidental laceration. On opening the stomach, the hole presented much the same appearance, being round and smooth-edged, the mucous membrane being somewhat retracted. It was not adherent externally to the abdominal walls.

On lifting up the stomach, a circumscribed abscess was found between the spleen and the diaphragm. The spleen was of a green colour, and covered with lymph ; there was no laceration of its substance ; the diaphragm had a large opening in it from sloughing. The liver was fatty.

The uterus contained patches of dark pigment within, as from altered blood.

The ovaries were healthy, but adherent to the adjacent structures.

In each of the two following cases there was an abscess in the left hypochondrium, which appears to have presented characters very similar to those of the abscesses already recorded in this series of cases, but the starting ground of which appeared to be a chronic ulcer of the stomach. These cases, therefore, bear somewhat the same relation to the other cases belonging to this series that is borne by Case 4 in the first series to the remaining cases in that series.

The case which I place next is one which I well remember, as it occurred when I was acting as clinical clerk to Sir W. (then Dr.) Gull.

CASE 12.—Subdiaphragmatic Abscess, occupying the Left Hypochondrium, and associated with a Perforating Ulcer of the Stomach; subsequent Perforation of the Diaphragm, and Empyema.

J. L—, æt. 64, was admitted into Clinical Ward, under the care of Dr. Gull, March 14th, 1860. He is a basket-maker by trade, and lives in St. George's-in-the-East. He has generally had good health, but has had rheumatic fever and (twice) inflammation of the lungs.

For two or three years he has had sickness and pain in the abdomen, coming on about two hours after taking food. A few months back he was sick after every meal. His bowels are costive. He has not brought up any blood. His appetite is good, but he does not eat, as it gives him pain. For two years he has had tenderness in the left hypochondrium. Five weeks ago he was attacked with general dropsy.

On admission he is a pale, rather wasted man, with an anxious face and an aspect such as is regarded as characteristic of malignant disease. His ankles are still slightly œdematous. His chest is healthy.

His abdomen is prominent but not tense. It is tympanitic in front, dull at the sides. Fluctuation cannot be felt, but fluid is evidently present, as the lateral dulness is increased, on either

side, by turning him so that that side is made lower than the other.

In the integuments over the left lower costal cartilages is a soft fatty tumour, and beneath this a mass in the position of the spleen. This does not descend during inspiration. Is it a mass of malignant growth in the peritoneum?

He was ordered Potass. Iodid. gr. iij, Pot. Bicarb. gr. x, ex. Julep. Menth., three times a day; a dose of castor oil at once; a linseed poultice to the abdomen; and low diet.

On March 19th, a pill of half a grain of opium was prescribed three times daily, an enema, and a diet of milk and eggs, with $\frac{3}{4}$ ij brandy.

On March 20th it is noted that he complains of great pain, impeding respiration, and extending upwards from the left hypochondrium (where the tumour is). His breathing is much hurried, 40 per minute. Pulse 112.

He died on March 22nd.

The post-mortem examination was made by Dr. Wilks.

The body was well nourished, as if death had occurred while the man was in good health.

The left side of the chest was dull, except at the anterior part, where a tympanitic sound was given out on percussion. On opening it the pleural cavity was found full of a thin purulent fluid, amounting to several pints. The lung was forced upwards, and compressed at the upper part of the chest. On removing the lung it was found healthy, but the chest was lined by soft lymph. On examining the diaphragm a small opening was seen, through which a probe could be passed to an abscess below. Through this opening, no doubt, some matter had passed, which had set up the pleuritic effusion.

The heart was healthy, but pushed over to the right side. On opening the abdomen the walls were found to be adherent on the left side over the left lobe of the liver and the stomach, but on tearing them off a large abscess was found in this corner of the abdomen. In front were the parietes and the left lobe of the liver, the latter being only implicated on its posterior surface in the wall of the abscess. The greater curvature of the stomach formed a part of the boundary; also, on its outer side, the spleen; and above, the diaphragm. The abscess was old, and thus completely circumscribed. The small opening

was seen at its upper part, whereby it had penetrated the chest. No other communication could be found, and none with any other organ. The abscess, however, extended along the stomach as far as the middle of its lesser curvature, and here, on opening this organ, a large chronic ulcer was found. This was in the usual position, and of the usual character. It was quite circular, of the size of a five-shilling piece, with edges raised and hard. The coats were quite destroyed, and its base was formed by the pancreas. So little new fibrous tissue had formed upon this that the lobulated character of this organ was at once seen on looking at the ulcer. At the anterior part of the ulcer there was a very thin spot where a perforation might with great likelihood have taken place, but the edge of the liver covered it; also, on the edge of the ulcer was a large open blood-vessel, but on opening this, to see how hæmorrhage had been prevented, a very firm clot was extracted. No direct communication was found between the ulcer and the abscess without.

The liver, spleen, and kidneys were healthy.

The next case is very similar to that just recorded; except that the connection between the gastric ulcer and the abscess was more clearly traceable. It is curious that both it and the former one occurred within a period of six months.

CASE 13.—Subdiaphragmatic Abscess, occupying the left Hypochondrium, and communicating with a perforating Ulcer of the Stomach.

M. A—, æt. 33, was admitted September 20th, 1860, into Lydia Ward, under the care of Dr. Barlow. No detailed report of the case is preserved; but a brief note is appended to the report of the post-mortem examination, from which it appears that she applied on account of pain in the left side, which had come on about a week before. She was very ill, and although the lung appeared affected, yet there was also clearly mischief below the diaphragm. She likewise had much sickness.

The post-mortem examination was made by Dr. Wilks.

Both lungs were the subject of pneumonia, especially at the lower parts. Thus the lower lobes had scattered through them

masses of grey hepatized tissue, and above and between these there was pneumonia of a more recent character. There were no tubercles in any part.

A large defined peritoneal abscess was found at the upper part of the abdomen on the left side; it was limited below by the omentum (which had become adherent to the parietes); above it reached the spleen, diaphragm, stomach, &c.; the fluid was of a dirty colour, and sour-smelling; and in squeezing the stomach, its contents were seen oozing through a small opening in the lesser curvature.

On opening the stomach, an ulcer of about the size of a four-penny piece was seen, situated at the usual site, at the lesser curvature. It was round, with sharp edges, and there was no induration to indicate that it had been of long standing.

In the following case, an abscess was found having almost exactly the same position and form as in the other cases in this series. The only organ that communicated with its interior was the transverse colon, in the wall of which there were two small apertures. However, as the mucous lining of the intestine was quite healthy everywhere else, it was considered doubtful whether there had been primary ulceration of the bowel, or whether the abscess had not rather opened into it secondarily;—a result which Dr. Habershon has shown to occur sometimes in cases of abscess within the abdomen, originally independent of the bowel. If the latter view be correct, the case would resemble Case 10; unless, indeed, the gall-stones which were also present had something to do with its formation.

CASE 14.—*Abscess in the left Hypochondriac and Epigastric Regions, communicating with the Transverse Colon.*

C. B—, æt. 56, was admitted August 11th, 1858, into Philip Ward, under the care of Dr. Barlow. He had been ill for several months, and had suffered from occasional vomiting, from pain in the region of the stomach, and from gradual wasting. About a week before death, he began to expectorate some offensive mucus. It was thought that he might have cancer of the stomach.

The post-mortem examination was made by Dr. Wilks.

There were firm pleuritic adhesions at the base of each lung; the upper lobes were healthy; in attempting to remove the left lower lobe from the diaphragm, the latter structure was found to have been perforated by a large ulcerated opening from one and a half to two inches in diameter; its edges were thin and irregular. The lung tissue was consolidated and lacerable. There were old pericardial adhesions over the left ventricle.

On opening the abdomen a cavity in the left hypochondriac region was found, lined by a false membrane, and containing about a pint of very offensive pus.

The cavity was bounded above by the diaphragm (perforated as before mentioned); on the left by the ribs; on the right by a part of the left lobe of the liver and by a part of the fundus and anterior surface of the stomach; below, by the spleen and the pancreas. In front the anterior parietes and colon formed its boundary, and between these the abscess extended as far as the gall-bladder, where, at the posterior part of the transverse colon, there were two small openings, about large enough to admit an ordinary probe, extending into the intestine. The edges of these openings were not thickened.

The stomach and intestines were healthy.

The liver was healthy, its ducts were distended; the gall bladder contained several calculi.

Dr. Wilks appends to his Report of the post-mortem examination the following note:—

“It remains a question whether the formation of the abscess preceded or followed the perforation of the intestine. The latter, no doubt, might have set up such an abscess, but then the intestine everywhere else was healthy.

“If the abscess was primary, what caused it? The presence of calculi suggested the escape of one through the duct; but of this there was no proof.”

In the next case, an abscess in the same region appeared to be traceable to an origin within the spleen. It might have been expected that this organ would have been a much more frequent starting point for such abscesses, than experience shows to be the case. It is true that the formation of an abscess in the spleen is itself a rare occurrence; but the spleen is very subject to

morbid changes set up by embolism, and these, as is well known, not rarely lead to local sloughings of its tissue.

CASE 15.—Abscess in the Left Hypochondrium, which had apparently commenced within the Spleen.

E. S—, æt. 32, admitted into Stephen Ward under care of Dr. Pavy. No history of this case has been preserved.

The post-mortem examination was made by Dr. Moxon.

There were some small dark brown spots about the pelvic peritoneum.

The colon in all its length was intensely blackened.

The splenic flexure was adherent to the upper and anterior face of the enlarged spleen.

The liver was natural as to size and shape; there was a uniform, slight, but decided cirrhosis, the lobules being marked out and separated from each other in the sections by firm areolar substance.

The capsule of the liver was thin.

The spleen was large and rounded: its upper two thirds were excavated by a large cavity with ill-defined walls and dark grumous contents; this cavity was bounded above by the diaphragm, on which were relics of the adjoining part of the spleen; and it could not be said where the diaphragm, the spleen, and the abscess wall were mutually limited; the lower third of the organ was large and round.

The last case is one in which an abscess in the left hypochondrium not only invaded the substance of the spleen, but even extended within the capsule of the left kidney. It was of course a question whether the last-named organ had not been the starting point of the disease, but Dr. Wilks (who made the post-mortem examination) was inclined to answer this question in the negative.

CASE 16.—Abscess between the Stomach, the Spleen, and the Diaphragm; extending also downwards within the Capsule of the Kidney.

G. S—, æt. 36, admitted March 6th, 1863, into John Ward,

under the care of Dr. Gull. He came to the hospital for lead colic. He said he had been employed in lead works only since June, but that during this time he had been obliged to give up work three times on account of colic. On the two last occasions he had also had five or six fits daily of an epileptic character, but these ceased when he desisted from work.

He was admitted for colic with the usual symptoms; after several doses of castor oil he was better.

A few days after his admission, and when better of the colic, he complained of pain and tenderness in the left side, so that he was not able to lie on that side. A friction sound was audible. Subsequently there was some dulness at the base of the left lung, with bronchophony.

No report of the case was taken after this; but it was stated that he became somewhat better. In the beginning of April he was worse again; he had repeated rigors, for which quinine was given him, but with no effect. They continued, and he daily got worse. His urine was healthy, and not albuminous. On examination, the only thing to be made out were the signs of pleuro-pneumonia at the base of the left lung, as before mentioned. He gradually got lower for the last few days. His breath was very offensive.

The post-mortem examination was made by Dr. Wilks.

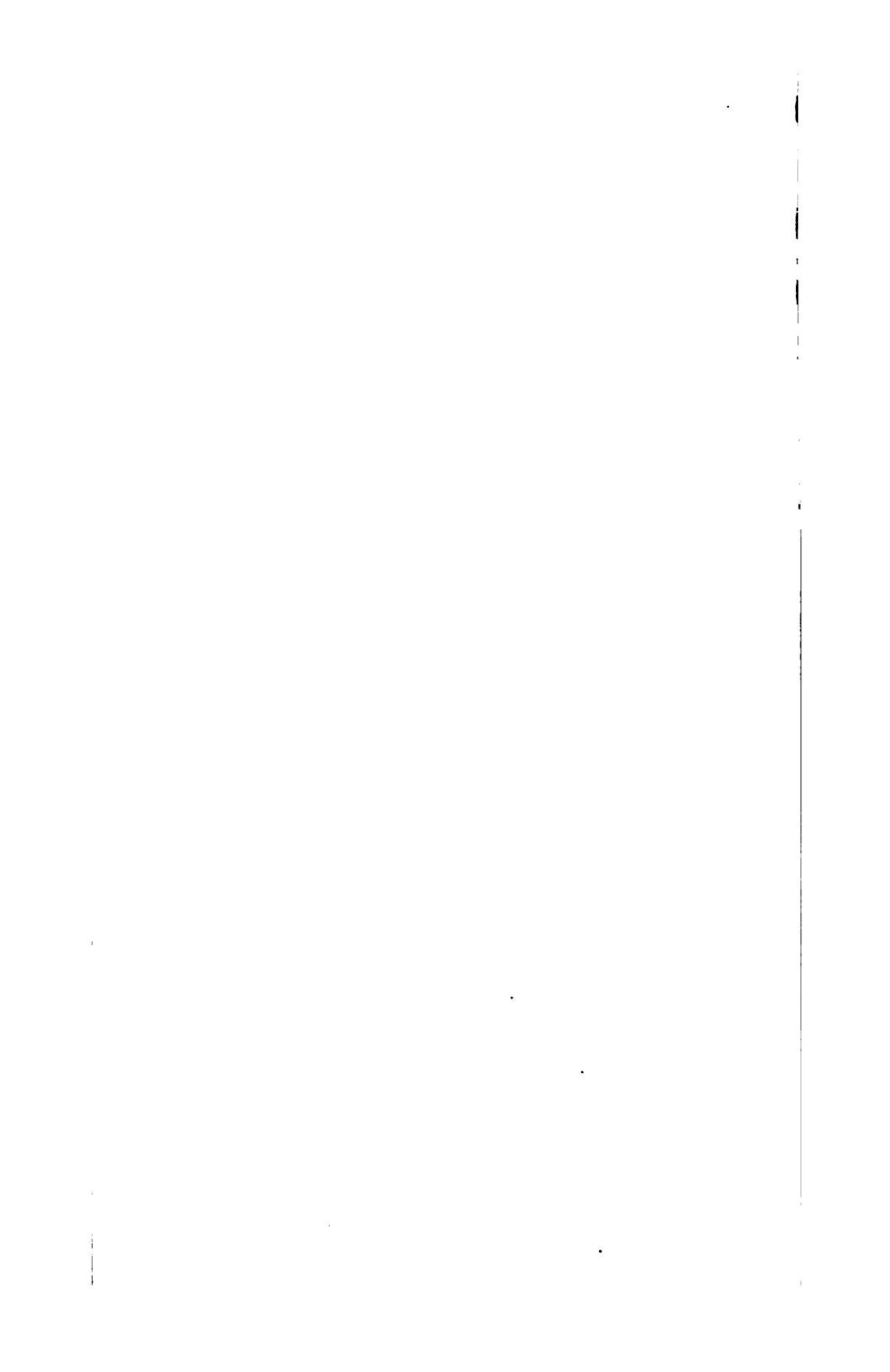
The left lung was adherent at its lower part, and in a state of gangrenous pneumonia, being more or less consolidated throughout; portions of the lung were gangrenous and very fetid; the base was indurated, and of a dark colour, as from chronic inflammation, and here the organ was firmly united to the diaphragm by a dense fibrous tissue. The diaphragm below was thin, but not perforated. The right lung contained a large amount of pigment, and there was some slight induration of its apex.

There were peritoneal adhesions of various parts in the left loin.

The stomach was adherent by its fundus to the spleen, and, on removing it, an abscess was opened; the spleen was also adherent to the diaphragm and to the kidney.

On removing some of the viscera from the abdomen, there was seen to be an abscess enclosed within the capsule of the kidney, except at the upper part, where it lay outside this structure,

and was circumscribed by the spleen, stomach, and diaphragm. When the stomach was removed the abscess was opened, but the stomach itself was not affected. The spleen had a large excavation in it, forming one side of the abscess. Above this the abscess reached the diaphragm, which was much softened at one spot, but was not perforated; the pneumonia on the other side had, no doubt, been set up by it; but without any actual communication. The upper part of the kidney itself was involved and partially destroyed like the spleen, and some matter had penetrated the substance of the organ, but had not reached the pelvis of the kidney. It appeared that the abscess had involved the kidney from without, rather than that the suppuration of the kidney had been primary.



A CASE
OF
ABSCESS BETWEEN THE DIAPHRAGM
AND THE LIVER.

BY FREDERICK TAYLOR, M.D.

THE case described in the present paper is of interest in connection with a series in which peritonitis leads to the formation of limited collections of pus, either among the viscera themselves, or between them and the abdominal parietes.

In a paper in this volume Dr. Hilton Fagge has published several examples of the most important variety of this condition, namely, that in which the abscess is situate in the right hypochondrium; and it is partly as a member of this group, partly as exemplifying a rather rare termination of injury to the liver, that the following case deserves to be placed on record. The patient was at first under my care, but during my absence from town in August was kindly seen for me by Dr. Hilton Fagge.

The notes are from the report of my clinical assistant, Mr. Nunez,

A boy, aged 13, was admitted July 28th, 1873, into Clinical Ward.

Three days ago the patient jumped into a waterbutt, with the object of having a bath. He was unable to get out of the butt by himself, and was obliged to remain there for more than an hour, until somebody came and assisted him out; he was then very cold and shivered. Whilst returning home he was kicked over the region of the liver, and fell down, unable to

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continue his journey. He was taken home and there was sick, bringing up large quantities of coagulated blood. At night he was unable to sleep on account of the pain in his right side.

The following day he was again sick, vomiting more blood, both fluid and coagulated: he remained in bed and had no treatment.

On admission his face was flushed, his skin hot and dry, and he complained of thirst. The tongue was clean and moist, the bowels confined.

The abdomen presented no external marks of injury; it was tense, rather prominent, and the superficial veins at the sides were somewhat enlarged. On percussion, dulness was found to extend two inches below the right costal margin, and the hepatic region was tender on pressure. The respiration was thoracic; the pulmonary and cardiac sounds normal; the urine normal. Pulse 112; resp. 34; temp. 103° F. Appetite moderate.

A linseed meal poultice was applied over the hepatic region, and he was ordered to take 3 grains of Dover's powder at night.

During the next few days his general condition was but little altered; he was cheerful, generally reported himself better, and scarcely complained of pain, though this was readily produced by deep pressure in the right hypochondriac region.

The same treatment, viz. poultices to the abdomen, and opium internally, was continued. The further report is as follows:

July 29th.—Pulse 100; resp. 48; temp. 102·4°.

30th.—Pulse 80; resp. 32; temp. 99·8°. There is slight dulness, with deficient breath sounds, at the base of the right lung.

August 2nd.—At the right base behind, dulness, with distant sniffling, bronchial breathing, and ægophony. Ordered,

Potassii Iodidi, gr. ij.

Mist. Salinæ ʒj, ter die.

4th.—The dulness has extended higher; there is bronchophony, not however ægophonic; the vocal fremitus is diminished. Pulse 76; resp. 40; temp. 99·8°.

5th.—Condition of lung similar. The hepatic dulness extends more than four inches below the margin of the ribs, the left lobe can be readily felt, and the abdomen is made

prominent by it. The pain in the right hypochondrium is increased. Morning pulse 72; resp. 40; temp. 104.4°. Evening pulse 120; temp. 103°.

6th.—The left lung is normal, the heart displaced, the apex beating under the left nipple. The pain in the right hypochondrium is constant, the hepatic dulness much increased, the abdominal parietes tense. Pulse 104; resp. 44; temp. 103.3°.

7th.—Lies on his right side with his legs drawn up. Pulse 120; resp. 36; temp. 103°. Evening pulse 116; resp. 40; temp. 101.6°.

8th.—Morning pulse 92; resp. 44; temp. 102.1°. Evening pulse 92; resp. 38; temp. 103°.

9th.—The dulness posteriorly extends to the middle of the scapula, the respiratory murmur being deficient. Poultices are applied to the abdomen. Morning pulse 120; resp. 36; temp. 104.3°. Evening pulse 100; resp. 36; temp. 102.6°.

10th.—Morning pulse 100; resp. 42; temp. 102.4°.

11th.—The patient is lying on his right side, with distressing pain in the right hypochondrium, and a short cough, which troubled him also last night. There is absolute dulness over the right side of the chest, with the exception of the apex, where there is still resonance: respiratory murmur and tactile vibration are absent. The heart's impulse can be felt in the seventh intercostal space in the left axillary line. Pulse 144; resp. 72, jerking; dyspnoea increased by decubitus on the left side; temp. 103.6°.

2 p.m.—There is continuous cough with expectoration of a light yellow turbid fluid, with a peculiar smell of fermented matter. The liquid has a neutral reaction, and shows under the microscope fat-globules and pus-corpuscles fattily degenerated, elastic tissue and amorphous matter. There is an offensive odour about the bed.

The dyspnoea is great, the lips and face livid.

4.30 p.m.—Condition worse. An exploratory puncture was made in the eighth intercostal space behind the right axillary line; only a few drops of blood escaped. The patient was immediately bled in both arms, and eleven ounces of blood withdrawn. He appeared to breathe better after the bleeding, but died quietly half an hour afterwards.

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The post-mortem examination was made by Mr. C. S. Ticehurst, house physician.

Dark complexion; well nourished. Heart, vessels, small and large intestine, and kidneys healthy. The pericardium contained some fluid; trachea injected, and red. Left lung congested, otherwise healthy. Right lung: the upper two thirds were compressed against the spine by a serous pleuritic effusion, containing some blood mixed with it. The lower third, adherent to the upper surface of the diaphragm and to the chest wall, was airless.

Abdomen: recent peritonitis, limited to the under surface of the liver and the duodenum. Under the diaphragm, between it and the upper surface of the liver, was an abscess containing about sixteen ounces of pus, and lined with a thick layer of lymph, which could be readily peeled off. A communication existed between the abscess and the lung through the diaphragm to which the lung was adherent, but there was no communication with the pleural cavity. The surface of the liver was flattened by the abscess, the capsule was thickened to the extent of about one and a half millimètres, and at one spot in it there was some ecchymosis, dirty-looking, as if of decolorized blood, evidently of a little standing, and probably the starting-point of the abscess. The organ was enlarged, especially the left lobe. The spleen was soft. The stomach was pale and healthy. The trocar had entered through the adherent pleura into the base of the lung; half an inch lower it would have reached the abscess, half an inch higher the pleural cavity.

The case is of interest from several points of view. The immediate effects of the blow appear to have been, firstly, considerable hæmorrhage from the mucous membrane of the stomach, which occurred immediately on his arrival at home, and again on the following day. Though described by his mother as of some large amount, the hæmorrhage was not sufficient to cause any blanching of the patient's skin, nor was it repeated after the second time.

The post-mortem examination failed to show any lesion of the mucous membrane of the stomach, or of any other part, which would have accounted for this symptom.

Secondly, it seems that the convex surface of the liver must have been stretched, so as to give rise to some ecchymosis, if not actual laceration of the capsule, and upon this followed the local peritonitis, terminating in abscess between the diaphragm and the liver.

Such a view is supported by the observation that the ecchymosis consisted of "dirty-looking, as if decolorized blood, evidently of a little standing," and, further, by the consideration that lesions of the liver are frequent on its upper surface.¹

I have suggested stretching rather than direct injury, because it seems unlikely that a blow neither fracturing the ribs nor making a bruise visible on the third day, would cause by direct violence any ecchymosis of the upper surface of the liver: whereas pressure applied suddenly at the lower border of the liver might be expected to render the anterior (upper) surface still more convex, and, finally, tear the capsule or even the tissue itself. A somewhat similar process, namely, stretching of the liver across the spine, seems to have occurred in more extensive ruptures, where the liver has been nearly completely divided by a rent running from before backwards, but not reaching the posterior border.

The determination of this point will lead one to watch carefully for evidence of hæmorrhage or suppuration between the diaphragm and the liver in injuries to the hypochondriac region.

The more remote effects of the inflammation were similar to those observed in other cases of sub-diaphragmatic abscess, traumatic or otherwise. The first change appears to have been a pleurisy, by which the base of the lung was fixed to the diaphragm below, and to a slighter extent to the parietes of the

¹ Mr. Bryant, in his 'Practice of Surgery,' p. 301, says:—"Fissures of the liver are usually met with on its upper surface." With reference to this point, I have examined the post-mortem records in Guy's Hospital Museum of twenty-two fatal cases of injury to the liver which occurred in the six years 1867—72: in by far the greatest number (fourteen) the injury was extensive, the liver being partially or entirely divided in an antero-posterior direction (six cases), or severely lacerated in various directions (eight cases), slighter injuries of the upper surface forming only two of the number, and of the under surface only three. The circumstances under which these lesions occurred appear in all cases to have been of the most serious kind, thus:—Buffer accidents contributed five, perhaps six, cases, falls from a height at least three, five men were run over, one was crushed between barges, and two were kicked by horses.

thorax; and the inflammation spreading over the remaining surface of the lung gave rise to an effusion so considerable as to compress the otherwise healthy organ both inwards against the spine and downwards towards the abdomen. This serous fluid was observed to have no connection with the abscess, and to have been even separated from the diaphragm by lung adherent in that situation.

It was only shortly before death that the expectoration of some fetid fluid announced the perforation of the abscess into the lung tissue.

That this was the order in which the changes took place is shown by the different characters of the contents of the pleural cavity and the abscess respectively, by the want of communication between these two spaces, and by the absence in the clinical history of any sudden severe symptom, by which the bursting of pus into a healthy serous sac would have been announced.

The early adhesion of the lung to the diaphragm is also an interesting feature in two somewhat similar cases, the notes of which are before me: in the first, an abscess beneath the diaphragm opened both into the pleural cavity and into an adherent gangrenous lung;¹ in the second, a collection of pus, similarly situated, perforated the diaphragm, and communicated with a cavity in the base of the right lung, which was hepatized.²

The analysis of 300 cases of hepatic abscess, quoted in 'Reynolds' System of Medicine,'³ seems to point to the frequency of the same occurrence, since it shows that the pus burst twice as often into the lung as into the pleural cavity, though it is possible that in some of these cases the lung was previously adherent.

The sequence of the pathological changes being so far clear, it remains to ask, what was the cause of death, and how far that termination might have been warded off?

The course of the symptoms was extremely rapid, and on his

¹ This is the case of W. T.—, which forms the first of the series recorded by Dr. Fagge.

² This case, not included in Dr. Fagge's paper, forms another interesting example of invasion of the chest through the diaphragm; I have appended it at the end of this paper (p. 264).

³ Vol. III, Art. "Suppurative Inflammation of the Liver," p. 327.

first presenting himself, three days after the commencement of his illness, there was already evidence of severe inflammation in the high fever, local tenderness, and extended dulness below the ribs. With regard to this, his physical condition at the time of the injury seems worthy of note.

Two days after admission there was slight dulness at the right base, and three days later the existence of pleural effusion became certain. Hitherto he had been ordered opium, with the application of poultices to the hepatic region. Iodide of potassium was given, with little hope, however, of staying the progress of the pleurisy, and on the seventeenth day of his illness he was in a state of extreme dyspnoea from the amount of the effusion, the abscess having apparently burst into the lung.

No doubt at this time the evacuation of the pleuritic fluid would have preserved him from immediate death, and have afforded an opportunity for the subsequent discharge of the pus from the abscess. The introduction of a trocar was not, however, successful, and a second attempt was anticipated by the death of the patient.

It was afterwards seen that the trocar had entered the lung near the diaphragm, passing below the pleuritic effusion, but not low enough to reach the abscess; and even had this been reached, and the pus evacuated, it seems highly improbable that the boy's life would have been saved without a similar treatment of the pleural cavity.

Indeed, it is evident that puncture of the abscess, to be of any service, must be performed before it has produced in the chest those secondary changes which tend so rapidly to a fatal termination.

The present case shows that these changes may appear in a few days and materially shorten the period during which evacuation of the abscess may be attempted with hopes of success; but the history of blow in that situation, the localised tenderness, the high fever, and low position of the liver, all point to a condition which would justify, even thus early, the attempt at relief by surgical means.

In the following case, to which I have referred above, general

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peritonitis set up by ulceration of the appendix cæci, gave rise to the formation of abscesses, one of which, situate above the liver, both perforated the diaphragm and induced pneumonia of the corresponding lung. This pneumonia was indeed, after the first day or two in hospital, the prominent feature of the case; but his illness had commenced with sudden abdominal pain and sickness, and tenderness over the hypochondrium, with extended resistance in that region, were marked throughout.

The examination confirmed the opinion expressed by Dr. Pavy, that the inflammation of the chest was secondary to disease in the abdomen. The patient, T. L—, aged 12, was admitted into Philip ward under Dr. Pavy, August 18th, 1869. The following notes are from the report of Mr. F. C. Turner, M.A.

He was quite well until Monday last, August 15th; he was then suddenly seized with severe pain in the abdomen, while sitting quietly indoors, and without any known cause. It began just before dinner and continued until the following morning, when it was worse than it has been since. At the time he was very sick, vomiting a quantity of yellow fluid. Shorter attacks, lasting about half an hour, have since occurred four or five times in the day.

On admission.—He is a delicate boy, with a flushed face, light hair, blue eyes. Abdomen flat, with some spasm of the recti; in the right hypochondrium is a decided tender spot. Tongue very red, furred at the edges; bowels regular, open freely every day. Thorax resonant; respiration harsh, rapid, thoracic. Heart sounds normal. Urine high coloured; sp. gr. 1015; no albumen; skin hot and dry.

August 19th.—Pain came on last night about 11.30 p.m., lasting half an hour; he complains of pain when sitting up. Face much flushed, skin very hot and dry; pulse 129, full; bowels not open to-day; no appetite for breakfast. Dulness commences on the right side of the chest at the fifth rib, and extends to the hypochondrium, where percussion causes pain.

20th.—Pain again last night at 12, lasting the same time: his bowels were open yesterday, and he slept well; took his dinner well, but had no appetite for breakfast this morning. Became very hot about noon to-day. Now has hot and dry skin, no thirst, but is very sleepy; pulse 184, regular; resp. easy, 28.

21st.—No pain last night; pulse 132, regular; resp. 45. Tongue very red. Dulness posteriorly extends one inch above the angle of the scapula. Respiration is bronchial, and the vocal resonance increased below the right nipple; crepitation could be heard; this side was also less freely movable than the left. The diagnosis was pneumonia, with no evidence of pleural effusion. Ordered,

Emplastrum Lyttæ, lateri dextro.
℞ Vin. Ant. Pot. Tart. ℥xx.
Liq. Opii Sed. ℥vij.
Ex Mist. Ammon. Acet. ℥j.

6tis horis sum.

23rd.—Patient's face is less flushed, and he does not feel so hot. The tongue is still very red; pulse 122, regular; resp. 48, more easy. Chest, in front on both sides wheezing sounds; bronchial breathing and increased vocal resonance are heard at the right base posteriorly. On the right side anteriorly distinct pneumonic crepitation at the end of a deep inspiration.

24th.—Crepitation on the right side is more distinct, and can be heard posteriorly to a less extent. Voice distinct, and rather shrill; dulness extends now up to the spine or the scapula.

25th.—Face flushed and perspiring; pulse 140; resp. 35, laboured. Abdomen rather distended; resonant except in the right hypochondrium, where there is continued tenderness. Dr. Pavy thought the pulmonary inflammation might be secondary to some inflammatory mischief in this neighbourhood.

26th.—Physical signs seem to be subsiding. There is now not much dulness, except at the base posteriorly. Abdomen rather tumid, and resistance over the liver is felt nearly as low as the umbilicus, where it ceases rather abruptly (? edge of liver).

27th.—The skin continues very hot; he perspires freely from the face from time to time. Crepitation is heard on the right side anteriorly in ordinary breathing, and a finer variety on deep inspiration. All over the left side loud bronchitic rhonchus can be heard, and felt by the hand; there is here no increase of vocal resonance. The boy feels better.

30th.—The boy does not appear so well, though he says he feels better. The skin is very hot; he complains of thirst; pulse 140; resp. laboured, though he is not conscious of being

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short of breath. Rhonchus all over the chest ; left intercostal spaces drawn in. Ordered,

Mist. Ammoniac ʒj, Stills horis.

31st.—Is drowsy, with eyes half closed ; discoloured lips. Is not easily aroused, but then answers sensibly. Less flushing of the face and heat of skin. Pulse 160, very weak. Breathing laboured ; mucous râles in larger tubes. Takes only milk and wine. Has been much purged since yesterday afternoon.

September 1st.—Death at 4.55 p.m.

Post-mortem examination made by Dr. F. Taylor.—The right pleura adherent universally, but easily separated. Gelatinous lymph near the base ; no fluid.

Pneumonia of right lung general, except a small portion at apex ; red hepatization, passing into grey. On the under surface, near the outer free edge, a small cavity about one third of an inch in diameter, with thick walls, and containing pus. This was situate near a small perforation of the diaphragm, by which it communicated with a collection of pus on the upper surface of liver. The pleura adjacent had a layer of adherent lymph.

Left lung : pneumonia of posterior part.

The abdominal viscera were united by recent peritonitic adhesion, in the form of bands and strings, which were easily separated. No injection of intestines. Collections of purulent fluid in several parts, viz.—in the left iliac fossa ; in the rectovesical pouch ; on the under surface of the liver ; around the hepatic flexure of colon ; and again between the gall-bladder and the round ligament. A large collection was situate between the upper surface of the liver and the diaphragm, and this muscle was perforated by a small hole, leading to the excavation on the under surface of the lung. On opening a collection of pus in the right inguinal region were found two brownish, soft, friable concretions, and near these was the end of the appendix cæci, which in its last one inch or three quarters of an inch was ulcerated through and almost destroyed. In the rest of its extent the appendix was healthy, as also the colon and adjacent ileum.

The liver was healthy on section, adherent in part to the abdominal wall by a thick layer of lymph ; above, separated from the diaphragm by the collection of pus described.

ON THE DIAGNOSIS OF DISEASES OF THE EAR.

By JAMES HINTON.

THE diagnosis of diseases of the ear rests on three bases :— (1) The examination of the various parts of the organ ; (2) Tests applied to the functions of the nerve ; and (3) The history and general condition. First in importance among these is the ocular inspection. The best instruments for the purpose are the simple, round or oval specula and a reflector ; one of more than the usual concavity is very useful ; or by means of a plane one, direct sunlight may be used, and the image of the membrane may be seen on the reflector by others (Lucae). A lens of about six inches' focal distance may be screwed with a joint on the back of the reflector, so that a magnifying power may be used or not, as desired. A speculum provided with a prism, to bend the light into the meatus, has been constructed by Dr. Blake, of Boston,¹ and Dr. Eysell has proposed a method which he accounts effective for the construction of a binocular speculum.²

¹ 'Report of Amer. Otological Society,' 1872.

² 'Archiv für Ohrenheilkunde,' 1873. Since a really efficient instrument of this kind would probably be very valuable for estimating the irregularities of form presented by the membrane, I append Dr. Eysell's suggestion, which appears as yet not to have been carried out:—"Two prisms of small refracting angles (3°-5°) are so placed in a setting that they touch one another with their refracting edges, and that the border surface of the one lies in the same plane with the border surface of the other that is turned to the same side, and these are intro-

Dr. Blake has also constructed small reflecting glasses, like those used by dentists, to be inserted into the tympanum in cases of perforation of the membrane when the state of the parts admits. And it is conceivable that in some cases of minute growths or caries these might be very valuable.

In introducing the speculum, it must be remembered that (beginning from without) the meatus winds, first, a little forwards, and then backwards and slightly upwards, so that there is a tendency for the eye to fall on the wall of the meatus, instead of reaching the membrane; and the speculum accordingly must be introduced well into the passage, and directed distinctly forwards, for the most part with a slight pressure on the outer part of the posterior wall, to straighten the cartilaginous portion of the canal. This will be much aided by drawing the auricle slightly upwards and backwards with the left hand. The anterior wall of the meatus projects slightly in its central part, and so not only hinders the view of the front part of the membrane, but causes the side of the speculum to project into the canal, so that I have often found a perfect examination facilitated by cutting a shallow notch in the speculum, and turning that side to the front in introducing it. In very young children the passage is extremely short, and the membrane lies almost horizontally.

The chief points to note in respect to the membrane are its degree of concavity; the appearance of the reflection of light from its anterior surface; the direction of the handle of the malleus across it; its transparency; its vascularity, whether there be thinner or thicker portions or deposits, or parts especially depressed or bulging; and, finally, whether it be wanting wholly or in part, and, if it be, the condition of the exposed tympanic wall. In addition, we must note the condition of the meatus, especially whether it be obstructed by exostoses, which not very unfrequently happens, or contain

duced between the reflector and the speculum, and as near as possible to the speculum; their edges must be vertical, and the border surfaces above described must run nearly parallel to the median plane of the patient. The observer now, by means of any of the customary reflectors, throws light upon the membrane through either of the prisms, and receives on the right and left eye respectively an image through each prism. With a little practice these are easily made to coincide.

fluid, or masses of wax or epidermis, or growths of fungi. The presence of either a small quantity of opaque fluid at the bottom, or of flakes of epidermis, may be very misleading, since they may simulate very closely the appearance of the membrane in some morbid states. When a layer of fluid covers the membrane a distinct pulsation is often seen; this generally, but not always, implies a perforation.

In states of perfect hearing the membrane may present considerable varieties of appearance, differing greatly in hue, in transparency, and sometimes presenting even dense masses of white deposit, occupying a considerable portion of its surface. In one instance of not only perfect hearing, but acute musical sensibility in a child, there existed apparently a solid rod of bone, running from the short process of the malleus to the posterior wall of the tympanum. Many cases have left on my mind the impression that an unusual thinness and transparency of the membrane, rendering the incus, stapes, and promontory distinctly visible, was associated with an impaired function of the nerve. But this is a point on which I have not yet sufficient evidence.

The most usual deviation from the healthy state seen in the membrane is that characteristic of chronic catarrh of the tympanum, generally accompanied with obstruction of the Eustachian tube. The natural curvature of the membrane in this case is lost, and it is altogether drawn in, with a distinct concavity. Often in such cases, if the membrane is transparent and the affection recent, it presents a distinct pink aspect, due to the congested mucous membrane of the tympanum shining through it; in more chronic cases the membrane loses its transparency, and becomes white and opaque. When the membrane has this appearance, and there arises the question how far other conditions besides mere closure of the Eustachian tube are present, the form of the surface of the membrane gives us some evidence. When simple closure of the tube exists, the membrane is of a moderately uniform concavity; if there be present also the results of chronic catarrh of the mucous membrane, the membrane, though it may be very much drawn in, will often have a flat appearance, and in many cases the malleus will be seen not only drawn inwards, but distinctly displaced backwards, and even drawn up into an almost

horizontal position, near to the superior border of the membrane. How this displacement of the malleus occurs is not, to my mind, yet sufficiently demonstrated. The formation of bands of adhesion, or shortening of the ligaments of the malleus, or contraction of the tensor tympani muscle, may all be causes, but also it seems probable to me that it is not unfrequently due to a contraction of the substance of the membrane itself, resulting from the continued presence, in the upper part of the tympanum, behind the malleus, of collections of viscid mucus, which are frequently met with in that position, and produce, first, bulgings of the membrane, and, afterwards, thinning and puckering of its substance. Chronic retraction of the tensor tympani muscle is also held to be a cause of indrawing of the membrane; and in some of these cases the malleus seems to be twisted on its long axis, its external surface being tilted forward.

In connection with the Eustachian tube another question arises, to which attention was first drawn by Dr. Jago, of Truro, and subsequently by Dr. Rumbold,¹ of St. Louis; namely, the effect both upon the hearing and the appearance of the membrane of undue patency of the tube. The subjective symptoms are unnatural ringing of the voice in the ear and undue perception of all sounds occurring in the throat. Dr. Rumbold has also carefully noted the appearance of the membrane in these cases, and has come to the conclusion that the functions of the tube have not hitherto been perfectly apprehended. He ascribes the concavity of the membrane, in its normal state, partly to the effect of the continued absorption of the air within the tympanum, which causes it to be constantly more rare than that in the meatus or the throat, so drawing the membrane slightly inwards. This difference of density of the air within and external to the tympanum is maintained at a constant pitch by a regulative influence of the tube, which in its normal condition is not wholly impervious to air, but permits, through its small superior curved portion, a continuous supply of air, which, however, has to overcome a moderate re-

¹ 'The Function of the Eustachian Tube in relation to, and the Renewal and Density of the Air in the Tympanic Cavity, and to the Concavity of the Membrana Tympani.' St. Louis, 1873.

assistance sufficient to maintain the normal concavity of the membrane. In other words, the membrane is maintained in its natural concave state, not merely passively, but by a constant balance of opposing forces—its own resiliency, which would carry it outwards, the absorption of the air within the tympanum, which draws it inwards, and the yielding resistance of the tube to the entrance of air, which, in the healthy state, does not suffer the absorption within the tympanum to exceed a certain effect. By the traction of the malleus and the action of the tensor tympani muscle, Dr. Rumbold thinks the membrane would be drawn into a shallow cone; by the continuously balanced rarefaction of the air it is caused to assume a *curved* concavity. It seems clear that hardly any arrangement could be imagined more adapted to preserve the membrane in a condition of sensitiveness to vibration.

The proofs adduced by Dr. Rumbold are cases in which, with abnormal hearing of their own voice, the membrane was visibly less concave than normal, and the hearing impaired, all the symptoms being relieved by the injection of fluid into the Eustachian tube. He remarks, also, that the effect of swallowing in relieving pressure of air within the tympanum is not sudden and complete, but only partial, and that, therefore, it cannot be held completely to open the tube, but only to diminish the resistance to the passage of air.

That the normal closure of the Eustachian tube is of a very slight degree is proved by the fact (first noticed by Lucae) that very thin and relaxed portions of the membrane, such as the scars of old perforations, will sometimes visibly move in and out coincidently with inspiration and expiration. This might be explained by the supposition that the closure of the narrow upper portion of the tube was effected by the fluid secretion of the lining membrane, which might move to and fro with the movements of respiration sufficiently to allow a motion in parts of the membrane which offer no resistance.

In the drier climate of America these cases are probably more frequent than in this more humid atmosphere, though similar cases do present themselves. I have seen them chiefly in cases of extreme emaciation, and sometimes the latter stages of phthisis are much aggravated by distress arising from this cause, especially if the patient is highly sensitive. This state seems

quite unconnected with the "inflammatory" disorganization of the tympanum that often occurs in the same condition.

Dr. Rüdinger,¹ of Munich, so well known for his anatomical investigations of the ear, reports that on swallowing during a lecture he felt the usual sensation in the ears, followed on the right side by a peculiar cramp-like sensation. His own voice sounded louder and of a different timbre, and even painfully loud, so that, though interested in watching the condition, he was compelled at last to perform another act of swallowing, when the condition ceased. He ascribes it to a cramp of the dilator of the tube.

Besides their own importance, these observations seem to me interesting as bearing on a subject that will repay much more investigation: the part played by spasmodic conditions of the muscles of the ossicula, and especially of the stapedius, in producing tinnitus. The cases are frequent in which no reasonable cause can be assigned for this symptom but some such affection of the muscles, due, perhaps, in the first instance, to slight irritative conditions of the mucous membrane. A clicking sound, sometimes audible externally, due to spasm of the tensor tympani, and attended with increase in the concavity of the membrane, as demonstrated by the manometer introduced into the meatus, is complained of now and then.

Another point to be considered in the appearance of the membrane is the prominence with which the bands that run forwards and backwards from the short process of the malleus stand out. This will give important indications of the degree of rigidity that is present; in some cases the simple division of one or both (as pointed out by Politzer and Lucae) gives great relief. The latter, also, has remarked that, in some cases of deafness in children, the membrane may be very concave, as if from obstruction of the tube, when it is not really closed or even much narrowed, but the nostrils are obstructed by swelling of the mucous membrane and excessive secretion, and the tonsillar region swollen, so that respiration is carried on with difficulty, and the air during inspiration is, as it were, sucked out of the tympanum. In such cases treatment addressed to the Eustachian region alone would, of course, fail to give

¹ 'Monatsschrift für Ohrenheilkunde,' September, 1872.

relief. But it may be safely affirmed that in every such case, whether the tube were closed or not (and to me the exceptions to its closure seem very rare), the surgeon's attention would, of course, be given to the condition of the whole naso-pharyngeal region.

In examining the membrana tympani special attention should also be paid to its superior border, to examine the condition of the thin portion above the short process (the membrana flaccida) and of the superior wall of the meatus. Both these parts seem very liable to morbid conditions. The membrane at this part may be densely thickened, or may seem wanting altogether, and the *neck* of the malleus, which lies behind it, seem quite exposed, or at other times a minute perforation may be seen there, or even a red mass of granulations; and very often, especially in conditions connected with long-standing discharge or accumulation of epidermis in the meatus, the upper wall of the meatus at the superior and inner part seems largely excavated, and masses of thickened discharge or epidermic flakes may collect, sometimes to an immense extent, and give rise, not only to great local irritation, but to general distress. This is quite independent of the formation of the *sebaceous tumours*, consisting of dense layers of epidermic cells, which sometimes form in the meatus, and are also very apt to infringe upon its superior wall.

The "white spot," or reflection of light from the anterior and lower part of the membrane, should never be overlooked. The changes in its form or length give indications of variations of curvature in the membrane; it becomes shortened with increasing concavity, and broken up with irregularities of surface. Till some familiarity is gained, the observer should be on his guard against mistaking the appearance of concavity for that of convexity, an error that will occur on viewing objects with one eye, and which I have known to happen with most accomplished surgeons. The distinct projection of the short process of the malleus in almost all cases of great concavity is, perhaps, the best guide.

Thicker and thinner portions of the membrane are easily distinguished, thinner portions being *dark*, as less reflecting; they are also more concave. They are often to be seen as dark spots on a generally thick and white membrane, when they may be

assumed to be for the most part scars; but most frequently thinned and sunk-in portions of the membrane are to be seen in the upper and posterior part, about in the position of the head of the stapes; and they are often in contact with, or even adherent to, that bone. The cause of the thinning of the membrane in this position is a matter needing to be farther explored, but it is almost certain that, in the majority of cases, it is due to the pressure exerted by masses of dense secretion formed during catarrhal affections of the tympanum, and which tend to collect especially in that region, that is, to cling around the ossicula, and very probably to accumulate in the posterior "pocket" of the membrane. I have certainly seen more "bulgings" of the membrane from collections of mucus in this part than in any other, and it seems to me that it is due to its entanglement in that position, owing to the presence of the chain of ossicles; and we cannot but feel how probable it is that mucus that had collected in this position, becoming dense and dry, should give rise to increasing deafness after all appearances connected with increased secretion had passed away. To what extent this is the case is one of the problems on the solution of which the prognosis in a large class of cases depends. For a "rigidity" due to that cause would be evidently much more susceptible of remedy than if it were the result of thickening or hardening of the structure of the mucous membrane itself, or of ligamentous or other immobility of the joints of the ossicula. My experience has led me to believe that the presence of such dried-up mucous secretion investing the chain of bones is one of the most frequent conditions which determine deafness in the large mass of chronic cases which occur, with more or less clear history of protracted or recurring attacks of catarrh dating from long before.

Cases illustrating this view, and the corresponding treatment by incision of the membrane, I have given in previous numbers of the 'Reports.' But, since the question is still *sub judice*, I venture to adduce in illustration a case reported by Dr. Magnus.¹ The patient was a man, æt. 73, but strong and healthy, affected with great deafness on each side. The right membrane was dull, and of reddish-grey colour. On inflation a slight temporary improvement ensued, with a yellowish bulging

¹ Of Königsburg. See 'Arch. f. Ohrenh.,' 1873, p. 265.

posteriorly. An incision was made, with escape of a little yellowish mucus, and the hearing improved a little. This was afterwards repeated with similar results, but Dr. Magnus found that even while the incision was open he could not pass air into the tympanum through the catheter, although the Eustachian tube was proved to be free by the unimpeded and painless passage of a bougie its whole length. Having found it impossible to clear the cavity of the tympanum from its abnormal contents by these means, treatment was discontinued. Eighteen months afterwards the patient died with symptoms among which aphasia was a prominent one. The petrous bone was healthy, but an abscess was found in the anterior lobe of the right hemisphere of the brain. The membrana tympani showed no sign of the incisions. On opening the tympanum it was found full of a mass of tough, yellow mucus, mixed with pus-corpuscles, but odourless, and readily drawing out into threads. It could not be removed either with a camel's hair brush or by a gentle stream of water, and extended into all the adjacent cavities. The mucous membrane was much thickened, and the natural ligaments were swollen into soft masses, which invested the ossicula; and one (which, as formerly described by Dr. Magnus, extends from the anterior ligament of the malleus to the bony portion of the Eustachian tube, and overarches its tympanic orifice) formed a kind of valve to the tube, and accounted for the occlusion.

In connection with the presence of abnormal secretions in the tympanum, other appearances are to be regarded. The slightest of these is one that may occasionally be seen in the early stages of catarrh, especially in the young—the outline of distinct *bubbles* on the inner surface of the membrane. It is necessary for this that the membrane should not have lost its transparency, and that the tube should permit the passage of air; the appearance will sometimes follow inflation of the tympanum by the india-rubber bag, and the air may be heard to enter with a slight moist sound. A more advanced stage of excessive secretion will give rise sometimes to a mottled or cloudy whiteness of the membrane, varying in degree at different parts, and which may be seen to be due, not to opacity of its external surface, but to a whitish semi-fluid substance in contact with it internally. Appearances of this kind lend great countenance to

Dr. Jago's opinion that the drying up of mucus into a thin layer on the internal surface of the membrane is a cause of deafness, which may sometimes disappear with a sudden crack, due to the peeling off of the secretion.

Another appearance presented by secretion within the tympanum is that of a slight yellowish discoloration situated at the most dependent part, and with a curved superior border, *which gradually shifts its position with the movements of the patient's head*, thus showing that it is due to the presence of a fluid. I believe it has not been noticed that the hearing varies in accordance with these changes in the position of the fluid, in cases that have been observed; but the changes in the power of hearing in accordance with the position in which the head is held are frequently very striking, and a shifting of more or less fluid secretion always suggests itself as a possible cause, but not yet with sufficient proof. The secretion in these cases, of course, is perfectly fluid, generally serous; but the existence of even a large amount of merely serous fluid is no evidence that a more viscid secretion is not also present.

Another appearance of excessive secretion is an obscure, yellowish, greenish-yellow, or brownish tint, appearing through the membrane, most frequently at the upper and posterior part, the membrane being in these cases almost always very concave, and the tube generally more or less obstructed. In these cases the appearance does not change with movement of the head, and the secretion is of dense and viscid character. On inflation of the tympanum a distinct yellow bulging is formed, unless the membrane is firmly held down by adhesions to the inner wall of the tympanum, but even then powerful inflation will often produce a limited protrusion of the discoloured part. In not a few cases, however, according to my experience, inspissated secretions may be present in the tympanum, and to a large extent, so as seriously to interfere with the hearing, without any appearance characteristic of their presence, the membrane being at the most white and opaque, and perhaps flattened. In some such cases I have found the history—being that of a distinct attack of catarrh, as, for example, an attack of cold following a fall into water—a true guide to the presence of inspissated mucus.

Alike in cases in which excess of secretion is present and

when it is not, the membrane may be seen fallen in upon the promontory and more or less adherent to it, or bound by bands of adhesion to various parts of the tympanic wall or the ossicula. In the former case the appearance at once reveals the condition, which was termed by Wilde *collapse*. The membrane is always very much thinned; it lies distinctly too remote from the eye, and the outline of the promontory is more or less distinctly visible; often the niche in which the fenestra rotunda lies is clearly marked; the malleus is seen to run inwards and to rest upon the tympanic wall, or it may be partly wanting, and most frequently the head of the stapes may be seen projecting just beneath the upper border of the membrane at its posterior part. Generally the Eustachian tube is obstructed, but if it is pervious, or can be made so, part of the membrane can generally be blown out into a more or less bladder-like form, leaving the central part still attached to the projecting portion of the tympanic wall. The bladdery protrusion forms generally in the lower segment of the membrane. This condition is sometimes found compatible with hearing so serviceable as almost to be termed good, and it can almost always be improved if the nerve-power is preserved. One point in respect to these cases is often difficult to decide, but it is not practically very important, namely, whether the membrane is really complete and only fallen in and adherent, or whether a portion has been destroyed and the edges have become adherent, so that more or less of the central portion really is the exposed tympanic wall. Some guidance may be given in determining this point by the appearance of the malleus. If the lower portion of the handle is wanting there is little doubt that the adjacent part of the membrane also is destroyed.

In these cases, and still more in those of more partial adhesion, and slighter collapse of the membrane, Siegle's pneumatic speculum is very useful. This is an ordinary speculum made of vulcanite, the wider end of which is enlarged into a small box covered in by a glass lens, through which the membrane is observed, while the small end is surrounded by india rubber, so that it can be fitted air-tight into the meatus. Thus the membrane can be seen magnified, as if beneath an air pump, for by means of an india-rubber tube attached to the outer part of the speculum air can be sucked out of the meatus,

and the membrane thus drawn out or forced inwards at the surgeon's will. Any retracted spots or local impediments to its motion can be thus made apparent. This instrument also (I may here anticipate so far as to say) is very useful in the diagnosis of the seat of tinnitus. There are many cases of most distressing noises in the ear, which are for the moment wholly or very greatly relieved by suction thus exerted on the membrane, and in these cases we may surely feel justified in ascribing the affection to pressure exerted on the labyrinth, through some condition existing within the tympanum; even though no visible indrawing of the membrane is to be seen. Thus, it seems to me, the idea of a primary or even a confirmed nerve affection may be excluded, and we have a means of safely affirming that not only the original but the existing cause of the tinnitus is situated in the tympanum, which is, of course, a most favorable element in the prognosis. I may also add that I have, though in but a few instances, found that permanent relief could be obtained by the patients through the continued careful use of suction on the meatus, by themselves, more or less frequently repeated.

Perforations, when they are large and in an irritable state, so that discharge still exists, are easily recognised after the meatus has been cleansed. The general surface of the membrane is usually whitish and opaque, often covered with more than one layer of half-loosened epidermis; the exposed surface of the tympanic wall is red and granular, often swollen, so as to appear quite on a level with the membrane, and the edges of the perforation present a well-contrasted border. But even this condition, plain as it generally is, may be simulated sometimes by a granular state of the surface of the membrane (resembling pannus of the eyeball); and which might be taken for a perforation, exposing a granular tympanic wall. The granulations on the surface of the membrane, however, almost always extend also to the wall of the meatus. Occasionally, such a granular condition coexists with a small perforation, which it completely conceals from view. But when the destruction of the membrane exists but to a small extent, or the whole membrane has become disorganized, it is often impossible to determine by the eye alone whether a perforation exists. The only sufficient proof then

is the inflation of the tympanum with air; either of the patient's own blowing, called Valsalva's method, or by the bag introduced by Politzer, or by the catheter; and the second method is generally the best. If the air enters the tympanum freely, and there is a perforation, it will be heard to escape through the orifice into the meatus with a rushing or screeching sound, according to the condition of the parts. The surgeon should listen by an india-rubber tube passing from the patient's ear to his own. As a rule, it may even be said that the diagnosis of a perforation should never be considered final unless air has been heard to pass through it. Little black patches (of wax, &c.), adhering to the membrane, are often very suggestive of perforations, but, according to my experience, a real perforation very seldom presents such an appearance.

Among the conditions that may accompany perforations must be mentioned polypi growing from within the tympanum, and just appearing at a level with the orifice, or slightly projecting, giving rise sometimes to appearances not easy to interpret. Large polypi occupying the meatus are, of course, easy to distinguish; they generally arise from within the tympanum, and the presence of perforation should be tested by inflation of the Eustachian tube. Often, however, minute growths of this kind are present, and maintain an obstinate discharge, and their existence should be very strongly suspected whenever there is a history of bleeding from the ear. They are sometimes difficult to detect, especially when they are situated deep in the anterior part of the meatus, close to the membrana tympani, where the projecting anterior wall of the passage may almost wholly conceal them. At other times, they may be seated quite at the superior part of the membrane, or close to the floor, or sometimes, in cases of perforation, may be detected half hidden behind the superior or other border of the orifice. In whatever position they are, it is impossible to effect a cure till they have been eradicated, and the surface from which they grow brought to a healthy state. Speaking generally, I conceive there can be little doubt that the cause of polypi in the ear is retained secretion; the fleshy growths which result from diseased bone form a different class.

When inflammation of the meatus or tympanum extends to the adjacent cavities, and involves the mastoid cells (a

contingency which should never be overlooked, and which is indicated by pain and tenderness in that region), or when it involves the bony cavities which extend to a greater or less degree above the roof of the meatus, the condition of the meatus is often of great importance, in respect both to diagnosis and treatment. A red and painful bulging of its posterior or superior wall frequently attends such extended inflammation, and in many cases a free incision there will give exit to pus, and avert most serious dangers. It is of importance to distinguish this condition from the much more frequent one of furuncles, which, however, may also occasion a great amount of pain and fever. Sometimes there will be found a distinct orifice in the superior wall of the meatus, from which a very sensitive and irritable fleshy growth may proceed. Whether or not this is always the result of caries of the bone in its ordinary sense I have not been able to ascertain.

The next means of local examination are those by which the conditions of the Eustachian tube and general faucial mucous membrane are tested. Among these, perhaps the priority may be given to the use of the rhinoscope, of which, however, I confess, it has not been my habit latterly to avail myself, finding that, while it was inconvenient to my patient, it seldom afforded me real help in diagnosis. Other surgeons, however, speak of it in high terms, and perhaps Dr. Pomeroy, of New York, has availed himself of it most largely. I therefore subjoin a statement of the conditions which he has discovered and treated by its aid.¹

“I. Mucus in the mouths of the tubes, with or without greenish or greyish mucus clinging or adherent to the post-nasal septum, and occasionally filling the nares.

“II. Increased redness in and about the mouth of the tube, or paleness of the mucous lining of the part.

“III. An œdematous condition of the parts near and in the mouth of the tube, resulting in more or less swelling. The swelling in the region of the tube, the result of hyperæmia or œdema, may (1) so far obliterate the mouth of the tube as to cause it to appear as a minute dimple, or obliterate it entirely

¹ Communicated by him to Dr. Roosa. See that author's 'Treatise on Diseases of the Ear.' New York, 1878, p. 278.

or (2) produce so much swelling of the collar-like surrounding of this tube as to greatly exaggerate it; (3) increase the elevation which separates the mouth of the tube from the fossa of Rosenmüller; (4) enlarge the posterior extremities of the middle and inferior turbinated bones, and produce a malposition in the posterior nares, and give it a rough and uneven outline; (5) cause a ring-like swelling around the tube, rough, red, and of a macerated appearance.

"IV. Granulations similar to those found in the pharynx in granular pharyngitis near the mouth of the tube.

"V. An apparent diminution in the mobility of the lips of the tube during contraction of the muscles.

"VI. Whitish striæ, indicating cicatricial degeneration of the proper substance of the mucous membrane in the region of the Eustachian tube."

The perviousness or obstruction of the Eustachian tube can, in recent cases, almost always be inferred from the appearance of the membrane, but not minor degrees of thickening, &c., of the tube, which may considerably diminish the calibre, and in long-standing disease, or when perforations exist, or the membrane is collapsed, the perviousness of the tube can only be determined by the passage of air through it. There are three ways in which this may be attempted. 1. The simple inflation of the ears with the mouth and nose closed (Valsalva's method). 2. Politzer's bag. 3. The catheter.

In either case the result is generally best appreciated by listening through an india-rubber tube to the sound of the entering air, but the changes effected in the appearance of the membrane by it are often of the greatest importance. Some of these have been already referred to; a very frequent one is a great bulging of the membrane at its upper and posterior portion, where the membrane may sometimes be blown out by a slight inflation into an almost bladdery form. In many cases this indicates simply that the patient, having experienced temporary benefit from the inflation, has accustomed himself to its frequent repetition and carried it too far. In every such case, or nearly so, the action has almost or entirely lost its good effect. The result, of course, is only seen when the tube is pervious.

The inflation by means of Politzer's bag is so simple

and efficacious that I venture to repeat the description of the process. It rests upon the fact that the walls of the tube are drawn apart in the act of swallowing. The patient takes a little water in his mouth to be ready to swallow at a signal, and the surgeon then introduces the pipe of an ordinary india-rubber bag into one nostril, closes the nostrils over it, gives the signal to the patient to swallow, and at the moment of his swallowing sharply compresses the bag. By this means air is forced into the upper part of the pharynx at the same time that the velum palati is raised, and the walls of the tubes are drawn apart, and it rushes accordingly along the tubes with sufficient force to overcome very considerable obstacles. The degree of force used can, of course, be adjusted to the amount of the obstruction. With children great gentleness should be used, and by patience, and accustoming them first to bear the tube in the nostril alone, and then to swallow alone, their timidity can generally be overcome. With very young children the swallowing can be dispensed with, the mouth being kept closed; and with them blowing through an india-rubber tube is often preferable to the bag. The bag should be of a size that can be easily grasped by the patient, if it be entrusted to him to use; and a valve, or an opening in the bag to be closed by the thumb, may be recommended, if he is likely not to remember to keep the bag closed until it has been withdrawn from the nostril. The nozzle of the bag should be guarded by a piece of india-rubber tubing. Dr. Allen recommends that two perforated pads should be employed, one of which should be pressed on the orifice of each nostril, and the air thus introduced at once into each. This plan is, doubtless, an excellent one, but I believe most persons find it rather less efficient.

I think I have observed that the stream of air enters rather more forcibly the tube *opposite* to the nostril into which it is injected. This is, perhaps, easily explained, if it be true, for the stream of air would scarcely receive its full *lateral* direction until after its exit from the other nostril had been resisted, so that the opposite Eustachian tube would receive the first and strongest direct action of the pressure. I would not affirm that there is always any perceptible difference, but I think that, even if there be the very slightest difference in the force of the pressure on the two sides, it should be recognised and taken ad-

vantage of. For, of course, the chief drawback to the use of Politzer's bag is that the effect cannot be limited to one ear. I therefore by preference apply it to the nostril opposite to that on which I desire the chief effect, and if the ear be healthy I desire the patient firmly to close the meatus on the sound side, to guard the membrane from the effect of the pressure. Whether this precaution, however, is really of any use I would not say, because any force which is thus kept from operating on the membrana tympani is, of course, virtually thrown, at least in part, on the structures within the tympanum. I have very seldom observed any evil results upon a sound ear from the use of Politzer's inflation, but it is, of course, very possible that ill effects might ensue, and the bag should be entrusted to the patient's hands only with precise instructions and careful supervision.

It is sometimes, though I think not often, requisite to use the Eustachian catheter for purposes of diagnosis. This is chiefly the case when, as sometimes happens, both Valsalva's and Politzer's methods give no reliable results—no decided change in appearance or distinct sound. When this is the case, or when the obstruction cannot be overcome by other means, the catheter should be had recourse to. The best form of catheter, in my opinion, is that made of vulcanite, as suggested by Politzer; great care should be used in cleansing them after use (since it is reported that syphilis has been conveyed by means of them), and in every case at least of their continued employment each patient should be supplied with a separate one. Several sizes are advisable, and different *curves* are required in different cases, since the dimensions of the pharynx vary greatly. The curve can be adapted to each case at the time; the silver ones being easily bent by the fingers, and the vulcanite ones also after being warmed in boiling water or over a gas flame. Sometimes a very slight curve indeed suffices; and in cases in which the nostril is very narrow I have sometimes found it better to make the curve extremely small, than to use a catheter of narrower bore and larger curve. In respect to its introduction the chief precautions necessary are to keep the beak well applied to the floor of the lower meatus of the nose, avoiding its slipping into the middle meatus as it is passed along; to carry it well to the posterior wall of the pharynx, and then to draw it forward

sufficiently before it is turned up into the tube—half an inch, on an average, in women, and slightly more in men. Lately, by Dr. Loewenburg, it has been advised to draw the catheter forward from the posterior wall of the pharynx with its beak still turned downwards, until it touches the posterior wall of the velum palati, and then to turn it outwards and slightly upwards into the orifice of the tube, which is situated in the same plane. In many cases this certainly renders the process more simple. The peculiar feeling of the catheter slipping into the orifice of the tube is one that cannot easily be mistaken when it has become at all familiar. It may slip with a somewhat similar sensation into the fossa posterior to it, but the sounds produced on forcing air into it at once reveal the mistake, being harsh screechy sounds, evidently arising in the throat alone. When either nostril, most frequently the left, is impassable for a catheter, it can be introduced through the opposite, and Dr. Noyes, of New York, has adapted the form of the catheter better to this purpose by giving it a slight second curve, carrying its extremity a little more upwards, so as to be more truly in the line of the tube.

The sounds heard during the passing of air into the Eustachian tube are of a value for diagnosis second only to the results of examination of the membrane. They not only decide the question of the perviousness of the tube, and, if the tube be pervious, of the existence of perforation of the membrane, but give evidence, more or less distinctive, of almost every other morbid condition of the middle ear. They have been classified by various authors with a degree of minuteness which I am far from saying is either excessive or inexact, for they present shades of an immense variety, to each one of which experience justifies us in assigning at least a probable significance. But there are certain characters of the sound which are perfectly definite alike in their qualities and their indications. First, there is the sound of the air passing through a healthy tube into a healthy tympanum, and distending before it a healthy membrane, which each one may best appreciate by distending his own tympanum. It is a sound like that produced by blowing gently into a small bladder, and may be perfectly appreciated by listening with a tube to any other healthy person. When the air is introduced by a catheter into a healthy ear, the

sound is a gentle continued blowing or rustle (*bruit de pluie*), seeming to come direct into the listener's ear; this is well contrasted with the distant rough sound, evidently not advancing towards the ear, which is heard when the catheter has missed the tube, and lies merely in contact with the wall of the throat. If the tube is open for part only of its length, and there is an obstruction at the narrowest part, or still closer to the tympanum, but the mucous membrane is free from excessive secretion, Politzer's or Valsalva's method gives no distinct sound, or a very slight one, but the stream of air from the catheter may be heard with its accustomed rustle, but much more faintly, and evidently stopping short of the tympanum. With a swollen state of the lining membrane of the tube, occasioning occlusion, but offering little resistance, as not unfrequently exists in children, the air passed in either by Politzer's bag or by the catheter may sometimes be distinctly heard travelling gradually up the tube, and, as it were, distending its walls, before it enters the tympanum, as if with a slight stroke. In other cases, also very frequent in children, when Politzer is used, the entrance of the air occurs with a slight, but sharp crack, which is always attended with great improvement of the hearing. In these cases the membrane has always been very concave, and the sharp sound heard may with every probability be ascribed to its suddenly resuming a more normal position, the obstruction being situated chiefly at the faucial extremity of the tube. But the sounds heard on inflation are, perhaps, most instructive in cases of excessive secretion from the lining membrane of the tube or tympanum. The degree of swelling and comparative amount of accumulated secretion will often reveal themselves with a great degree of accuracy on careful and repeated examination, especially if the catheter be used, from the slight squeak which attends blowing the nose during a cold, to distinct prolonged gurgling or bubbling, evidently within the tympanum, and loud creaking or rattling sounds seated in the course of the tube. Then, finally, there are modifications of the normal sound of the entering air indicative not of increased secretion, but suggestive rather of an unnatural dryness of the mucous lining of the tympanum, or of abnormal roughnesses and irregularities of its surface. Such are harsh, dry murmurs, unnaturally loud, on

the employment of the catheter, a hard creaking on Politzer's inflation, or total absence of audible sound from it, although the membrane on inspection is seen to have yielded to the air. Among these sounds, one of the most characteristic is a prolonged "piff" on the patient's own inflation, very different from the slight normal rustle. The signification of this class of sounds I feel, as yet, to need a better explanation. Perhaps certain atrophic conditions of the mucous membrane have part in producing some of them, as hypertrophic conditions may be indicated by others; and the presence of dense and inspissated mucus is, doubtless, the origin of some as yet undefined abnormal sounds. But these questions need reconsideration in the light of a new and rapidly increasing experience.

In addition to the sounds produced by the direct entrance of the air, Dr. Gruber has insisted on the importance of secondary sounds, which may be heard after the primary sound has ceased, and are due to the reaction of the membrane and other tympanic structures against the pressure of the stream of air. These are, however, only sometimes audible, and their precise signification remains to be determined. It must be remembered that inflation may sometimes fail to produce its natural sound or to affect the appearance of the membrane, not because the tube is really impervious to air, but on account of valve-like structures existing at or near its entrance into the tympanum. Such a case I have quoted from Dr. Magnus; and Mr. Yule,¹ who is able at will to open the Eustachian tubes, gives it as his opinion that such a valve-like condition exists on the ground of the greater difficulty he finds in withdrawing air from the tympanum than in inflating it.

There is another question deserving more investigation than it has received in connection with the act of inflation of the tympanum, namely, that in some conditions, unconnected either with any acute affection, or with any previous history of giddiness, the simple inflation, performed without violence, will induce an intense and distressing attack of giddiness. I have noticed this effect only in cases in which there was also reason for believing some affection of the auditory nerve (though, perhaps, only secondary to a tympanic affection) was present; and most probably it is to be ascribed to the pressure exerted

¹ 'Journal of Anatomy and Physiology,' November, 1873.

by the act upon the labyrinth. It might possibly be a sign of a condition otherwise not easy to diagnose with any certainty: excess of labyrinthine fluid. On one occasion, after introducing the catheter with no unusual difficulty, and inflating the tympanum with air in the accustomed way, the patient, an apparently healthy man, æt. 28, after complaining of giddiness, fell down in a fit, apparently epileptic (with bilateral convulsions). Recovery soon took place. I ascertained from his medical attendant that he had never been subject to epilepsy, and that no affection of a similar kind existed in his family. He has continued since in perfect health, and under treatment directed chiefly to the throat, and avoiding inflation of the ear, his hearing has considerably improved.

If the tube cannot be opened by either of the above-mentioned means, aided by the use of vapour of chloroform instead of air, a bougie should be had recourse to; for without its employment the extent of the obstruction cannot be rightly estimated. I find thin laminaria bougies by far the most effective, and absolutely free from objection when used with due precautions: namely, (1) never to introduce beyond the isthmus (or narrowest part of the tube) a bougie that should not easily lie in it in a healthy state; (2) always to withdraw the catheter and bougie *together*, or the catheter first; this, of course, because the bougie swells, and to attempt to withdraw it *through* the catheter causes it to break; (3) never to attempt to inflate the tympanum with air on the same day on which the bougie has been used, in order to avoid extravasation of air.

II. The second element in the diagnosis of disease of the ear consists in tests applied to the power of hearing. The voice, the watch, and the tuning fork are the means still most relied on, but the notes of musical instruments are sometimes important aids, especially in certain limited nerve affections. All the means are yet imperfect, in a theoretical sense, inasmuch as there is no test of the exact intensity of either of them. Dr. Lucae has devised an instrument for measuring the loudness of the voice (a "maximal phonometer") in the form of a short kind of speaking-trumpet covered in at the end with a piece of elastic sheeting, the movements of which are exhibited on a dial. By this means the relative hearing power of different patients might probably be more accurately tested. But to me it seems

that, practically, satisfactory results can be attained by the ordinary methods. One improvement, however, a suggestion of Dr. J. S. Prout, of New York, seems desirable to be usually adopted. It is, in stating the hearing distance by the watch, to give, not the number of inches it is heard, but the fraction of the average or normal distance; using this normal distance as the denominator. Thus the hearing distance of the watch I ordinarily use is about forty inches; and accordingly I should describe the hearing of a patient who heard at six inches as HD $\frac{6}{40}$; and of one who heard on contact as $\frac{2}{40}$. It should be remembered in respect to the watch that its tick is louder in proportion as it has been recently wound up: and that it is no accurate test of the power of hearing the voice. On one occasion I was consulted by a patient for deafness of a considerable degree, whose well-hearing brother heard the watch much worse than himself. Also during treatment the hearing in respect to the watch or the voice may undergo great changes without proportionate change in respect to the other.

In regard to the hearing of the voice, there are differences in the modes in which hearing is impaired, all of which do not as yet seem capable of explanation. But in general it may be remarked that distinctness and moderate slowness of utterance are always of more importance than mere loudness. Some persons hear even a low voice near at hand, but cannot hear at a distance; others the sound of many voices together totally confuses. Not unfrequently the muscles of accommodation seem distinctly at fault, the difficulty not being found in hearing individual slowly articulated sounds, but in following the naturally rapid changes of the voice. Hearing better when listening is very frequent; a person not taking notice even of a loud address, unless his attention is excited, and then hearing fairly a much lower tone. Children are often most unjustly blamed on this account. It is a natural supposition to ascribe this to the action of the stapedius muscle, as regulated by the portio dura nerve; but I feel that this view is best kept at present in the position of a mere conjecture. When, as is so often the case, and even in conditions of tympanic and not mainly of nerve affection, the hearing is decidedly worse on listening, the assumption generally is that the emotions are at fault.

A very little experience suffices to show that among people with impaired hearing various articulate sounds are heard with very different degrees of ease. Twenty, thirty, and forty and fifty, are badly heard, *e.g.* as compared with the numbers beyond them. Dr. Oscar Wolf has made some very careful experiments on this point.¹

He finds that each true consonant has its own pitch and accompanying harmonics, and that they are heard at varying distances; *sch* is the most audible, *h* the least so. The vowel-sounds are audible in the following order:—*a* and *o* the best, then *ei*, *e*, *i*, *eu*, *au*, *u*. In the case of perforations of the membrane Wolf found that the diminished hearing stood in direct relation to the loss of substance, that the vowels were much better heard relatively than the consonants, and that these were heard better in proportion to their height in the scale and the richness of their sound in harmonics. The loss of any of the ossicula also caused a confusion at the end of words, as if from lack of proper support to the stapes, the final letter, and sometimes others also, seeming to run into a series of sounds. The difficulty of hearing was diminished by a rhythmical utterance of the words. The pitch of the *resonance* of the meatus and tympanum, taken as a whole, is raised by a perforation, so that the lower-pitched consonants are more interfered with than the higher. But though perforations diminish the resonance of the membrane, and so reduce its power of reinforcing sounds, they do not interfere with its vibrating power, and (as experience also proves) impair the hearing much less than hindrances apparently much slighter to the reception or transmission of vibrations by the ossicula. It is hardly necessary to remark that in testing the hearing by the voice the patient should not see the mouth of the speaker, and that in children the watch can be relied on only when the eyes are closed.

Next to the voice, and, indeed, superior to it for some purposes, stands the tuning-fork. We owe the first scientific appreciation of the value of this test to Lucae, who began his investigations by a study of the reason for which a tuning-fork vibrating on the head is heard better if the meatus is closed.

¹ 'Sprache und Ohr. Braunschweig,' 1871. The whole volume is well worth study.

The balance of opinion on this point appears to be that the vibrations, which would otherwise escape through the meatus, are thrown back upon the tympanum and labyrinth, and so increase the hearing; but Lucae prefers to ascribe it to a gentle pressure exerted on the labyrinth by the closure of the passage. However this may be, the information practically conveyed by this simple circumstance is of immense value. In one-sided deafness there is at hand a simple, and in the main, most reliable test for the most fundamental of all questions as regards prognosis, namely, whether the affection is confined to the conducting media or involves also the nervous apparatus. In any case in which one ear alone is affected or one ear markedly more than the other, it suffices to place a vibrating tuning-fork on any part of the mesial line of the skull, and ascertain, with due precautions for accuracy, from the patient, whether it is heard louder on the worse or the better side, at once to form a rough classification of the disease. If better on the worse side it depends on obstruction to the passage of vibrations; if better on the better side the nerve is probably at fault. Even when there is reason to believe in the existence of a nerve affection of both sides, if the tuning-fork be heard *louder* on the worse side we may still infer that the difference between the two ears is (partly at least) due to the lesion of the conducting apparatus on the more affected side. It is necessary, of course, thoroughly to guard against the tendency of the patient to say what he expects to feel instead of what he really experiences; a tendency intensely strong even in the most cultivated classes. I much prefer to place the tuning-fork upon the teeth rather than on the vertex, and it is best placed on the lower teeth, the mouth being closed. The sound seems to be conveyed with much more certainty to the auditory nerve through the teeth than through the bones of the head in any other way. Many patients, I find, will hear it well on the teeth, and yet very imperfectly when placed on the vertex, so that while its being heard but a short time in the latter situation affords no real evidence that the nerve-power is impaired, I am inclined to believe that its being heard but a short time when fairly applied to the teeth is very strong evidence that the nerve has suffered. But the value of the tuning-fork in this respect is less negative than positive. Whatever the other

symptoms may be, if the tuning-fork is well heard when placed upon the middle line of the teeth, we seem to be justified in holding that the disease is one that leaves the auditory nerve unimpeded in its function. In testing the amount of hearing by the tuning-fork it seems to me the best plan is to transfer it rapidly from the patient's teeth to one's own, having first ascertained that one's own hearing of it is fairly keen. It has been suggested by Von Conta, however, to strike the fork with a definite degree of force and to note the number of seconds it is heard, having, of course, practised the hand in striking uniformly and discovered the normal duration of the sound. It is good to have various tuning-forks, as the results are not always exactly the same with different ones, and, indeed, I have been, in rare cases, unable entirely to reconcile them. But the same fork made with a strong *clamp* will give any note, and one has been constructed by Dr. Blake, of Boston, with a small hammer attached, the force of the blow of which may be estimated by a dial. It must not, however, be inferred that always when the tuning-fork is heard worst on the most affected side the nerve is implicated. Cases have occurred to me and others in which, even when this symptom existed in the most distinct manner, treatment adapted to remove mucus from clogging the ossicula was thoroughly successful.

But it is through observing the effects which closure of the meatus produces upon its sound that the chief value of the tuning fork is gained. The closure may either (1) increase the sound, or (2) may have no effect upon it, or (3), in some rare cases, may diminish it. The mode of testing is to press the tragus lightly, but firmly, back, occluding the passage, but avoiding pressure upon it, unless it is expressly intended to note the effects of pressure. The normal reaction is to increase the sound; this denotes, so far, absence of obstruction to the passage of sound; if the increase be great—"doubling the sound," the patient will sometimes say—we may infer that the meatus and tympanum are for functional purposes healthy. If closure produces no effect upon the sound, or in so far as the increase is of less than the normal amount, it indicates that sound does not pass as it should through the tympanum, and examination will almost always reveal the fact of some hindrance. It is, therefore, a *good sign* in any case of deafness that

closing the meatus should have no effect upon the sound of a tuning-fork placed on the head or teeth, because it affords presumptive evidence that the lesion lies not deeper than the tympanum. It is held by one eminent authority,¹ that in purely nervous affections closure of the meatus does not increase the sound of the tuning-fork placed on the head or teeth. This is a point worthy of all examination. My experience had led me to the contrary conclusion; and in cases that on other grounds I diagnose as nerve-affections, I tend to hold the patient's hearing the tuning-fork better with the meatus closed to be a confirming stroke to my opinion of his unhappy state, as indicating that the source of his affection lies deeper than the tympanum. (3) Rarely, closing the meatus diminishes the hearing of the tuning-fork. On this point clinical experience gives us as yet scanty data. I will, therefore, report a case in which the symptom appears well-marked and unquestionable.

G. W.—, æt. 32, a thin, somewhat worn-looking man, consulted me on 22nd November last; he had been for four years troubled with attacks of giddiness at times, but was otherwise well, and his hearing good. About last Easter, during a cold, he became somewhat deaf on the right side, and a blowing noise came in that ear; he describes it as a little rushing of water, or small windmill. This appears now to be synchronous with the pulse. He was then decidedly more giddy; the deafness continued, on and off, till June; since then has been better. Had pain also on the right side of the head. The pain ceased after taking bromide of potassium (from Dr. Leared), and the giddiness seemed better, but has returned. Is worse when worried, or after wine; digestion weak; is moderate; does not smoke. No deafness in family. Had slight syphilis many years ago; married four months; not in any respect worse since.

On examination of the ear: watch—right $\frac{3}{4}$ %, left $\frac{2}{4}$ %. Tuning-fork not heard fully on the teeth, loudest on the left, the best side. On closing the meatus, T. F. heard much *louder* on the left side: much *less loud* on the right; the effect being distinctly

¹ Dr. Roosa, of New York. See his 'Diseases of the Ear,' p. 488. I am not aware of any other statement to the same effect.

opposite on the two sides. Sucking air out of the right meatus diminished the tinnitus for the time. The membranes were fairly healthy on each side; on the right there was a slight appearance of whiteness at the upper posterior edge, and on inflation, which was free, and with natural sound on each side, the right membrane yielded at that part slightly more than the left. Inflation had no effect on the hearing of the watch. A little wax had been removed from the right meatus by syringing. Throat fairly healthy.

My diagnosis of the local condition was: an increase of fluid pressure on the right labyrinth, with no considerable affection of the tympanum; this increased pressure causing alike the tinnitus, the impaired hearing, and the giddiness. This opinion was based mainly on the fact of the diminution of the sound of the tuning-fork on closing the right meatus. Increasing the pressure on the meatus still more diminished the sound, while inserting an elastic tube into the meatus, and closing it close to the ear so as to prevent exit of vibrations, but not to exert pressure, had scarcely any effect. The temporary relief of the tinnitus on removing the atmospheric pressure from the meatus and so drawing the membrane outward, tends to confirm this view, which is however, as yet, matter of theory and unconfirmed.

Considering next the source of this local condition (in which I had the advantage of consultation with Dr. Leared), there appeared to be reason to assign it to the existence of irregular gout, there being a small deposit, such as Dr. Garrod has pointed out as consisting of urate of soda, in the auricle of the left ear. He did not remember any family history of gout. The iodide of potassium was ordered; and an ointment of the same, with Tr. capsici, to rub around the ear.

On the strength of cases analogous to this I am of opinion that a diminution of the sound of the tuning-fork on closing the meatus, indicates comparative free passage of sound through the middle ear, and some abnormal condition of the labyrinth which causes increased pressure on it, through the tympanum, to operate injuriously to its function. I may add that I have not discovered any really efficient treatment.

There is another condition connected with the reaction of the ear to sound, of which I do not know the correct explanation;

I have met with it in patients, and experienced it in a marked manner myself; in my own case it was evidently connected with faucial catarrh; not severe, and affecting one ear only, entirely ceasing after a short time. The condition is a peculiar sensitiveness of the ear to particular sounds, and even to particular notes of the scale: in my own case the sounds were bells, *fa''* of the piano or harmonium, and in a less degree *fa'* and *fa'''*. These sounds produced in my ear a distinct clang precisely like the jarring of a loose violin string, lasting for a few seconds: there was slight general deafness also on that side, and the tuning-fork was heard loudest there. It is difficult to me to believe that the seat of the affection was one of Corti's fibres; I seemed to feel it in the tympanum. But why it was called forth only by special sounds I do not know: the note was much lower than that which corresponds to the natural resonance of the meatus, which Helmholtz fixes at *e'''* or *g'''*.

Many other anomalies of hearing, especially inability to appreciate certain pitches or groups of sounds, are met with either as idiosyncrasies, or in various abnormal states of the nervous apparatus. Their source lies presumably in the cochlea.¹

III. The general condition of the patient. I have left this till the last, because it seems to me, contrary to the advice of some great authorities, best deferred until the local conditions have been examined. Many of the causes of deafness are exclusively local. Even when they are not so I believe that all of them are aids and guides to a more general investigation, which the study of them much more naturally tends to stimulate than to supersede. But here an infinite task opens upon us. The disease that may not directly or indirectly impair the functions of the ear is probably not yet discovered, nor will the zeal of generations exhaust the links that bind even so minute an organ into unity with every other portion of the frame, and tend to

¹ Two additional methods of estimating the conduction of sound by the tympanum, introduced by Politzer and Lucae respectively—the double otoscope and the interference otoscope—were referred to in the volume of the 'Reports' for 1867. A good account of the latter, which is a very scientific instrument and promises great results in the future, may be found at p. 77 of Dr. Roosa's 'Diseases of the Ear,' published in New York; or the reader may consult the 'Archiv für Ohrenheilkunde,' B. iii.

make it a sharer in the penalties of every divergence from the state of perfect health. But among the few things we know in this sphere we include such as these:—First and chief, the effect of the exanthemata in injuring the tympanum of children, and of other fevers at all ages, a source of evil which will be more than half averted, and not a few lives probably be saved, when every medical man shall hold it his duty to be prepared to trace the first threatenings of ear disease in the course of these affections, or, rather, to anticipate them, so as to note their most unsuspected advance, and give them efficient treatment before their work of destruction is achieved. (2) Gout is one of the chief enemies of the ear, but its effects are rather to be traced, it appears to me, in obstinacy of affections of ordinary kinds than in any specially characteristic symptoms. A peculiar irritation, with dull redness and swelling and semi-watery discharge from the meatus, notwithstanding local remedies, is very characteristic of its presence. Whether the chalky deposits so frequent in the membrane are ever of gouty origin, or whether gouty deposits occur within the tympanum as well as in the auricle, I believe has not yet been ascertained. (3) In phthisis, as is well known, the ear participates, and it has occurred to me not only to strive in vain for, but even temporarily to attain, results in respect to the ear which the progress of phthisical disease soon abolished. In such cases it is our duty, of course, to abstain from painful or even laborious remedies. (4) Syphilis has a certain part in aural disease, but how large a part is not yet decided. Its influence is most marked in its hereditary form, as pointed out by Mr. Hutchinson; every now and then deafness seems a feature of syphilitic sore throat, but if this is a frequent occurrence the specialist does not see much of it. What amount of subsequent deafness ensues or remains after all recognised syphilitic action has ceased, and so passes undetected as a result of that disease, I cannot offer an opinion. But I do not think that syphilis is among the frequent causes of obstinate obstruction of the Eustachian tube, because the classes among whom I have found this most frequent have certainly not been those most exposed to that cause. Of course, the cases of extensive ulceration obliterating the faucial orifices of the tubes by scars are not here referred to. (5) Albuminuria has been detected as a cause of tympanic disease in the

form of hæmorrhage, but both this affection and diabetes remain as yet almost unexplored in this direction. (6) The relation to disease of the ear of the convulsive diseases of children also, of diseases of the teeth, of abnormalities of the cerebral circulation, of the poison of ague, of the climate of India and the effects of quinine, of exhausting attendance on the sick, of parturition and suckling, of overwork at school, of depressing emotions, of relationship of parents—these and many more are questions which the student of diseases of the ear has to do his best to solve; and not less important—but, indeed, in their practical relations more important—the effects, in their turn, of even lightly regarded affections of the meatus or tympanum upon the general health, challenge his watchfulness.

ACTION
OF THE
POISON OF THE COBRA DI CAPELLO,
OR NAJA TRIPUDIANS.

BY ALFRED S. TAYLOR, M.D. F.R.S.

AN opportunity occurred to me in June last of performing some experiments with the poison of the cobra di capello, or *Naja tripudians*. A small quantity of the cobra poison in a dry state was given to me by Mr. Blackburn, formerly a pupil at Guy's Hospital. It had been obtained in India in 1861, and preserved in a small corked bottle.

With the aid of my colleague Dr. Pavy, the experiments were performed in his Physiological laboratory.

The poison was in the form of dry yellow-coloured scales, resembling pure albumen in a desiccated state. It weighed 4·2 grains; and allowing for the loss of water by desiccation, it probably represented about half a drachm of the recent poison.

Two grains were weighed out. It was hard, dry, and brittle, but easily pulverized in an agate mortar. The powder was gradually mixed with thirty drops of distilled water, by which it was speedily softened, and by trituration was brought to the state of a colourless, transparent fluid. A portion of it had the visciduity and adhesiveness of mucus, adhering to the platinum stirrer like a mass of transparent jelly. No odour could be perceived either in the dry or the wet state. There was no sediment. Ordinary blue litmus paper underwent no change when placed in contact with the fluid, but paper of a very

delicate shade indicated after a short time a faint acid reaction. Turmeric paper was not affected. The liquid might be described as almost neutral. Alcohol produced in the small portion of liquid remaining in the mortar, a dense white coagulum. It was clearly insoluble in that liquid.

The two grains thus dissolved, including the gelatinous portion, were introduced into a wound made in the side of a rabbit by Dr. Pavy. The wound penetrated into the cellular tissue beneath the skin; very little blood escaped. The poison was well diffused beneath the skin, and care was taken that no portion escaped. The edges of the wound were then sewn up. No particular symptoms manifested themselves for a quarter of an hour. Mr. Henry Ashby undertook to watch the animal, and I subjoin a note of his observations:

"3.45 p.m.—Operation completed.

"4.—Began to show symptoms of loss of power in limbs, particularly in hind legs, resting its body on the table without supporting itself on its limbs. It got up and moved when irritated. Respirations quick.

"4.10.—Cannot support itself on its legs.

"4.15.—Lies over on its side. Respirations slow. Eyelid shuts lazily when the cornea is touched.

"4.20.—Eyes insensible to the touch. Six or eight slight convulsions.

"Respirations and all movement ceased twenty minutes after the poison had begun to act. Chest opened five minutes afterwards. Heart still beating, and continued to beat for five minutes after the chest was opened, when it became engorged and stopped."

A middle-sized healthy dog was selected for the next experiment. The animal had been kept without food for many hours. Two grains of the poison, finely powdered and mixed with a small quantity of powdered gum to give it uniform consistency, were brought to a fluid state with half an ounce of water. This was injected into the stomach of the animal by means of a catheter. The syringe was thoroughly washed out, and the washings were injected into the stomach. No symptoms of poisoning were at any time observed, and on the following day the dog was as well as usual, and took his food with appetite.

The conclusions derivable from these experiments are confirmatory of the observations made by others: 1. That the cobra poison acts readily through a wound. 2. That in similar quantity it does not act through the mucous membrane of the stomach. Another conclusion may be drawn which is of some interest. The cobra poison retains its properties even when brought to a dry state and kept for the long period of *twelve years*. From this it may be inferred, that it is not volatile nor, when dried, liable to spontaneous decomposition.

Dr. Christison has published a similar observation with regard to this poison. He describes his specimen as having the appearance of small fragments of gum arabic. It had been kept for *fifteen* years when he tried its effects on a strong rabbit. A grain and a half dissolved in ten drops of water having been introduced between the skin and muscles of the back, the animal in eight minutes became very feeble and averse to stir, so that it remained still, even when placed in irksome postures: occasional slight twitches of the limbs supervened: at length it became extremely torpid, and breathed slowly by means of the abdominal muscles and diaphragm alone, and in twenty-seven minutes it died exhausted, without any precursory insensibility. The heart contracted readily when irritated, nine minutes after death, so that the poison seemed to operate by causing muscular paralysis, and consequently arresting respiration. ("On Poisons," 4th ed., p. 629.)

The quantity of this poison which I received was too small to allow of more than a few chemical experiments. It was proved to be feebly acid, soluble, and readily miscible with water, and insoluble in alcohol. The portion which remained (0·2 grain) after the performance of the physiological experiments, was only sufficient to allow of the detection of sulphur and nitrogen. These elements were readily detected by the application of heat; ammonia and sulphuretted hydrogen were evolved in about the same proportion as if dried albumen had been employed in the experiment.

We are indebted to Dr. Fayrer for nearly all that is known of the chemical and physiological properties of this poison in the recent state. In the splendid work which he has lately published, the '*Thanatophidia of India*,' he has given the details of a number of experiments performed on different

animals with the poison of the cobra and other venomous serpents.

As the poison is emitted by the cobra, it is according to this author a colourless viscid syrupy liquid, not unlike glycerine in appearance. It is soluble in water, and is slightly acid in reaction. The poison may be diluted with water, solution of ammonia, or alcohol, without destroying its deadly properties. It may be kept for months or years, dried on slips of glass, and still retain its virulence.

We are further informed that the poison, which is freshly taken from the poison-duct, is somewhat opalescent, but that that which is pressed out of the poison-gland is clear, becoming opalescent only after a time. When rapidly desiccated, it may be kept for years without change, and in the fluid state it undergoes decomposition only slowly. It has been preserved in this state for some months without being decomposed, in which respect it differs from other albuminous liquids. Dr. Fayrer could not detect in the recent poison submitted to the microscope, any definite characters, and Dr. Armstrong could not separate from it any crystallizable principle. This gentleman found it to be partially coagulated by heat, it gave a white gelatinous precipitate with the mineral acids, and with absolute alcohol. When warmed with sulphate of copper and caustic potash, it gave, like albumen, a violet-coloured liquid. Chemical results simply show, that it is an albuminoid mucous secretion associated with fatty and saline matters. Science can at present throw no light upon the cause of the tremendous power which this apparently simple fluid exerts upon animal life.

According to some authorities it contains an organic principle called *echiduiue*, to which its poisonous properties are due. This is said to be analogous to the ptyaline of saliva. Dr. Armstrong could detect in it no distinct principle of this kind.

The poison is most deadly in warm weather, when the cobra is fresh and vigorous, and has not bitten for some time. Mammalia and birds are strongly affected by it, cold-blooded animals more slowly, but non-venomous snakes and even molluscs die from it, some very rapidly.¹ The poisonous snakes are to a

¹ It has been stated that the *Mongoose* or *Mungus* (*Herpestes griseus* of India), a kind of weasel, suffered no ill-effects when bitten by a cobra. But this

great extent insensible to their own venom, as well as to that of other serpents, but the poison is not absolutely inert upon them. Dr. Fayrer made cobras and daboias bite themselves, but they never seemed the worse for the bites. But a large vigorous and fierce non-venomous snake (the Ptyas) was killed in an hour by the bite of the cobra.

The operation of the poison appears to be chiefly on the nerve-centres, the brain, medulla oblongata, and spinal marrow, which it paralyzes; it also destroys muscular force. In animals killed by the cobra, the blood was found to retain its property of coagulation after death; while it was observed that in animals killed by the daboia, a highly venomous serpent, the blood lost its coagulating power and remained permanently fluid.

The poison operates, like other poisons, through the blood. It is absorbed, sometimes with such rapidity as to produce well-marked symptoms in a few seconds after the bite. In most cases, however, it acts more slowly, as in the rabbit which was the subject of the experiment described in this paper. No symptoms were manifested for a quarter of an hour. It appears, like strychnia, and other poisonous alkaloids, to require a certain time to accumulate in the blood. Dr. Fayrer traced the poison directly to the blood by a series of physiological experiments. He proved that the blood of an animal killed by the poison was itself poisonous. When the poisoned blood was injected into a healthy animal, it produced the symptoms of poisoning. He states, that he thus transmitted the poison through a series of three animals, with a fatal result in each case. It is worthy of note, too, that with this, as with curara and some other poisons, the flesh of an animal killed by it is not poisonous, a fact which may be ascribed either to the gastric mucous membrane not readily absorbing the poison, or to the small proportion of it diffused by the blood through the flesh. Dr. Fayrer states, that animals and men ate the flesh of the poisoned animals with impunity. His servants ate all the fowls killed by the bite of the cobra in the experiments which he performed, and none of them suffered any ill effects.

is a popular fallacy. This animal, when bitten, dies from the bite, like other animals. Like the *Ichneumon* of Egypt, its wonderfully quick and noiseless movements enable it in a contest with a cobra, to seize it by the back of the neck, and kill it by wounding it close to the head.

It has been hitherto a generally received opinion among physiologists, that the serpent poison is inert when placed in contact with the gastric mucous membrane, and the results of the experiment on the dog recorded in this paper, are confirmatory of this view. Dr. Fayrer, however, in operating with the recent poison, has come to the conclusion that it may be absorbed through serous and mucous membranes. Thus he states, that the cobra poison killed animals when introduced into the stomach, put into the eye, or applied to the peritoneum, and he relates that one of his assistants had a narrow escape owing to a small portion of the poison falling on the conjunctiva of the eye during an experiment. It was found under these circumstances to have an irritant action, for it produced in the conjunctiva a violent inflammation.

When applied to the mucous membrane, the effects were less dangerous than when introduced into the blood. The poison placed on the conjunctivæ of a dog caused symptoms of poisoning rapidly and strongly, although these were not in all cases fatally developed.

Although the poison is essentially a neurotic, it appears, like that of the wasp and bee which is strongly acid, to have a local irritant action. Thus it sometimes causes severe pain, or a burning sensation in the part bitten, with rapid swelling of the surrounding skin, and ecchymosis followed by partial paralysis. After some hours, there is swelling of the hand and arm, with restlessness, feverishness, thirst, and great excitement, the patient tossing about his arms and legs, and rolling his head from one side to the other, the pulse almost imperceptible, the breathing hurried, forty in a minute, face suffused, the pupils contracted and insensible to light. The general symptoms observed by Dr. Fayrer were depression, faintness, hurried breathing and exhaustion, lethargy, nausea and vomiting. As the poisoning proceeds, paralysis appears in animals, sometimes affecting the hind legs first, and seeming to creep up the body, and sometimes affecting the whole body of the animal at the same time. There was loss of co-ordinating power of the muscles of locomotion. Other symptoms observed in man and animals have been hæmorrhagic effusions, relaxation of the sphincters, and involuntary evacuations, sometimes of a sanguineous or of a muco-sanguineous character, and death is generally pre-

ceded by unconsciousness or accompanied with convulsions. Among the symptoms occasionally met with, have been stiffening of the muscles with tetanic rigidity, thickening of the tongue with difficulty of speaking, and a feeling of suffocation.

The poison has been supposed to destroy life in some cases by producing paralysis of the heart, death taking place suddenly; but it was found in several experiments, that after convulsions and paralysis, the heart has continued to beat vigorously. This was noticed by Dr. Fayrer in his experiments on rabbits, in which artificial respiration was kept up. In describing one of them, he states that the rabbit appeared quite dead, but the heart pulsated vigorously. Mr. Ashby observed in the experiment related in this paper, although artificial respiration was not resorted to, that the heart of the animal continued to beat for five minutes after the chest had been opened. In Dr. Christison's experiments the heart retained its irritability for some time after death. The poison does not therefore appear to have any direct action on this organ, or its contractions would hardly continue so long while the animal was in a state of apparent death. This persistence of the heart's action was observed in the case of one of the keepers at the Zoological Gardens in the Regent's Park. This man, while carelessly handling an Indian cobra, was bitten on the upper part of his nose. No symptoms appeared for twenty minutes. The man then began to stagger in walking, he could not speak intelligibly, and there were slightly convulsive movements of the mouth and limbs. In thirty-five minutes he had lost the power of speech, and was nearly unconscious. He moaned, grasped his throat, tossed his head from side to side, and moved his arms and legs in an uneasy restless manner, not apparently convulsive. He could not support himself in a sitting posture. His face was livid—his eyes were fixed: the pupils were rather large, and acted sluggishly to light; the skin was natural; pulse 120; the pulsations were unequal in force. On the upper part of the nose were some small punctured wounds, from which a small quantity of blood had flowed. The eyelid of the right eye was swollen and livid. In forty minutes the movements of the limbs had entirely ceased, the lividity of the face was more strongly marked, natural respiration had ceased, and but for the

continuance of the pulse, the man might have been pronounced dead. The pulse was then 32 per minute, remarkably regular, some of the beats being strikingly full and bounding. Artificial respiration and galvanism were employed and continued for ten minutes. All muscular action had then ceased: the man was dead. ('Report by Dr. Norman Chevers.') In this case no severe symptoms appeared until after twenty minutes, and death took place in fifty minutes after the infliction of the bite. The action of the heart went on in a regular manner for some time after breathing had ceased, and when the man was apparently dead. This persistence of the heart's action is similar to that observed in death from asphyxia.

Dr. Fayrer describes, among the local effects of the cobra poison, a *septic* action. If the bitten animal survived, the wound and parts about it were apt to slough and produce septicæmia.

Death may take place in from one to two hours, or within twenty-four hours. One case proved fatal after sixty-three hours. This was of unusually long duration. The cobra poison was found quite capable of destroying the life of a full-grown dog in half an hour, and even in a shorter time. Dr. Fayrer believes that it has proved fatal to man with equal rapidity. He found that when the poison was at once injected into the circulation by a large vein, life was destroyed in a few seconds. In no case does it appear that the poison was so rapid in its effects on man and animals, as to render it necessary to adopt any other theory of its action than that which depends on its entrance into the blood by absorption, and its diffusion by the circulation. The poisoned blood operates primarily by annihilating nerve force in the brain and spinal marrow.

Dr. Fayrer examined the blood of poisoned animals, but he could not discover therein any corpuscular changes. The blood was darkened, and in some instances, as it has been elsewhere stated, its coagulating power was destroyed. The change in the colour of the blood was indicated during life in an experiment made on a strong fowl. A drop or two of cobra poison diluted with water was injected into the thigh of the bird. It soon began to droop, seemed drowsy, and crouched down with its beak resting on the ground: it then fell over on its side. The comb and wattles lost their bright red colour and became

dusky. Almost simultaneously convulsions occurred. Artificial respiration was commenced by means of a canula inserted in the trachea, and the comb regained its bright red colour. On discontinuing the artificial respiration, the lividity of the comb reappeared, and convulsions again began. This experiment was repeated about ten times with similar results. When the tube was withdrawn the comb became dark-coloured, the convulsions returned, and the fowl died.

On the results of this and similar experiments Dr. Fayrer thinks that the best mode of treatment is to maintain the arterialization of the blood by artificial respiration. This has had the effect of prolonging life in animals, and of giving some remote chance of recovery by the elimination of the poison. In the case of the keeper of the Zoological Gardens (ante, p. 303), this mode of treatment was adopted, but it utterly failed. Could this treatment in any case be maintained sufficiently long to allow of the entire elimination of the poison, and the restoration of the blood to its normal condition?¹ As the poi-

¹ It is stated that in one experiment, in which artificial respiration was employed, the heart was kept beating for *nine hours* after the development of the symptoms of impending death. The heart then failed only from imperfect respiration carried on in the cold, a fact which shows the necessity of maintaining the warmth of the body as an essential part of this treatment. If death was the result of mere asphyxia from the paralysis of the muscles of the chest, there is no reason why this treatment should not succeed, but it is highly probable from other experiments, that the blood itself undergoes changes, apart from non-oxygenation, which render it wholly unfitted to sustain the nerve-centres in their normal condition. Dr. Fayrer recommends the treatment as tentative and experimental, and not as a certain means of preventing a fatal result.

Mr. Richards, Civil Medical Officer of Balasore, has been able to maintain life for a long period, and under adverse circumstances, by the employment of artificial respiration. "In one case the heart's action was sustained for ten hours, though convulsions had set in when he commenced artificial respiration." He was compelled to stop the artificial respiration in this instance for want of assistance. In another case he kept up the heart's action for twenty-four hours and thirty-five minutes. Of this case he says :

"This is, perhaps, the most remarkable case of its kind on record. The dog was, to all appearances, dead when the artificial respiration was commenced. Two hours and a half later, convulsive movements were excited by the application of the galvanic current, but at seven o'clock there was no response, and the body of the dog was cold. At this time the eyes presented a glazed appearance, being perfectly dry. The pupils were dilated, and the heart was beating feebly. Had

soning depends on the absorption and transmission of the fluid venom by the blood, the preventive treatment should consist in arresting by ligature the circulation between the part bitten and the body. This mode of treatment must depend greatly on the situation of the wound, while its beneficial effects will be in proportion to the early application of the ligature after the bite. It appears from the author's report, that the complete arrest of the circulation by a ligature is the only method which has hitherto been of any great service in poisoning by the bite of cobras. No method has yet been discovered by which the effects of the poison while circulating in the blood can be counteracted; in other words, there is no known antidote to this poison, *i. e.* no substance is known which, when absorbed or injected into a blood-vessel, can restore the blood to its original healthy condition, and neutralize the further action of the poison upon it. Any substance which cannot bring about these changes in the circulating fluid is not deserving of the name of antidote. Many supposed native remedies were fairly submitted to trial, but in properly attested cases of poisoning by snake-bite, the effects were negative. Ammonia, whether injected into the blood or actually mixed with the poison, and then introduced into a wound on an animal, did not in any way counteract its effects. The proposed remedy, like strychnia, might kill, but it could not save an animal bitten by a vigorous cobra. Strychnia is reported to have been found a very effectual antidote! A dose of it proved fatal to dogs and cats by inducing fatal tetanus before the cobra poison had had time to take effect!

The *post hoc propter hoc* system of reasoning has, no doubt, led to many erroneous conclusions regarding recoveries from

artificial respiration been now stopped, the heart would have ceased to beat almost at once."

At noon the next day the dog appeared as if it would recover. "The eyes had lost the glazed appearance, lachrymation was restored, and there was winking of the lids on dropping water into the eye, attempts at deglutition when water was put into the mouth, and the heart was beating vigorously." It is more than probable that artificial respiration was not perfect, even in this instance.

Mr. Richards advises that "when reaction occurs a ligature should be applied on the proximal side of the bitten part, in order to retard or prevent the absorption of any of the poison which may be lying in the tissues about the bitten part." According to him, the cobra-poison acts primarily on the spinal cord and *medulla oblongata*, and secondarily, only on the cerebrum and cerebral ganglia.

snake-bites as it has done in ordinary medical practice. The only native mode of treatment which has been attended with occasional benefit is the cauterization or immediate excision of the bitten part; but in a case of rapid absorption, even this treatment would fail.

In a case which occurred to Mr. Chapple, reported in the 'Lancet' for July 12th, 1873, a man was bitten in the thigh by a cobra. The bite had the appearance of an incised wound, and much blood escaped. A strong solution of carbolic acid was applied to the wound in about three minutes after the bite. No unusual symptoms were witnessed for an hour. The man then became restless, uneasy, and loquacious, but he appeared to have control over himself. He swallowed liquids readily. In about an hour and a quarter he lay down, and it was observed that his finger-nails became of a livid blue colour. He was found to be dead: he retained his senses until just before death, and died without convulsions. The carbolic acid, although rapidly applied, had not destroyed the poison or prevented absorption, but it probably retarded its entrance into the circulation. Some experiments performed by Dr. Fayer throw a light upon the failure of the treatment in this case. First of all, with regard to the effect of a ligature, he found it was all but impossible, with the strength of a pair of hands, so to tighten it, as to effect the complete strangulation of a dog's hind leg. The circulation through the bitten leg of a fowl was in several experiments completely arrested, the ligature being tightened before the cobra had withdrawn its fangs. The poison was thus prevented from entering the system, and the wound was treated with strong carbolic acid and thorough burning with a red-hot iron; and yet, on the ligature being removed, the poison penetrated into the system and killed the fowl! If the part bitten is a toe or finger, immediate amputation might be performed with some hope of success.

In death from this animal poison, the *appearances* in the body have not presented anything characteristic of its action. In a case which proved fatal in about twenty-seven hours, the following appearances were observed:—Two small punctured wounds on the first phalanx of the index finger of the left hand (the part bitten): the left hand and arm were much swollen up to the axilla. There was great congestion of the blood-vessels

on the surface of the brain; a softened state of the brain-substance, and a small quantity of serous fluid in the right lateral ventricle. The lungs were collapsed, but gorged with very fluid blood. The apices of these organs were emphysematous. There was a large clot of blood in the left ventricle of the heart, and there were several clots in the right ventricle and auricle. In some instances there has been infiltration with decomposition of the tissues.

In the case of the keeper of the Zoological Gardens (p. 303), the body was examined thirty hours after death. Frothy blood issued from the mouth and nostrils. There was livid discoloration of the neck, face, and upper part of the chest. Rigor mortis was strongly marked. Bloody fluid issued from the wounds in the nose. It was found that the punctures from the serpent's teeth had penetrated into the cellular tissue, which was infiltrated with dark blood. The brain and spinal cord were not much congested, the latter was softer than usual at its lower part. The lateral ventricles contained a transparent fluid. The lungs were gorged with black blood, and the air tubes were filled with a black frothy fluid. The right cavities of the heart contained dark fluid blood with loose coagula. The left were empty. The other viscera presented no appearances calling for special notice.

In this country we occasionally hear of the death of a person from the bite of a viper, but the occurrence is so rare that very few medical practitioners have had any personal experience of such cases. The symptoms and treatment, therefore, excite but little interest. Far different, however, is the position of the Indian medical practitioner. The annual number of deaths from snake-bites will surprise those who have been accustomed to regard this form of animal poisoning as exceptional.

Dr. Fayrer began his statistical researches on this subject in 1867, and he has published the results in his great work on the 'Thanatophidia of India.' Taking one year only, 1869, the deaths from the bites of serpents in our Indian empire amounted to 11,416, and of these 6645 deaths occurred in Bengal alone, the most fatal being the bites from the Cobra and Daboia. He believes, that if all the fatal cases were recorded throughout India, they would not amount to less than 20,000 deaths annually! They would therefore, so far as our Indian empire

is concerned, form a large item in any regular returns of mortality. The Cobras are so numerous that, according to one report, when a good reward was offered by our Government for the destruction of them, more than 1000 were brought in from one district in the course of six months!¹

Many of the facts contained in this paper have been taken from an essay, of which a copy was forwarded to me by Dr. Fayrer, 'On the Nature and Physiological Action of the Cobra Poison,' by Dr. Brunton and Dr. Fayrer; also, from the large work by Dr. Fayrer, entitled, 'The Thanatophidia of India,' a work which reflects the highest credit on the author.

¹ Dr. R. S. Mair, late Deputy Coroner of Madras, states that Dr. Fayrer has rather underestimated, than otherwise, the total number of deaths from snake-bite in India, when he specifies 20,000 as the probable number that occur annually. The actual aggregate annual number of such deaths throughout the Presidencies of Bengal, Madras, Bombay, the North West Provinces, the Central Provinces, Oude, Punjab, Coorg, Hyderabad, and British Burmah, is stated by Dr. Muir, according to recent returns, to be no less than 25,664. In the Madras Presidency alone nearly 2000 persons are destroyed every year by snakes, and in one district of that presidency, namely, Tanjore, the average annual number of deaths from this unnatural cause is 250, or one person in every 6000, the population being estimated at 1,700,000.

Various circumstances favour the increase of these destructive reptiles. It appears that in 1869-70, when a reward was offered in Oude for each snake brought to the District Office, as many as 5625 snakes were destroyed in one year! Oude is the smallest of the eight regularly constituted divisions of British India. The reward was withdrawn, and the result was that in 1870-71 only 167 were destroyed. A friend, long resident in India, informs me that one evil effect of offering a reward was, according to general belief, that the natives encouraged the breeding of the reptiles for the sake of receiving it! Native prejudices are also at work. The Brahmin shudders at the very idea of their destruction. His respect for the life of the snake, in common with other animals, is due to his firm belief that their bodies are tenanted with human souls, and consequently that by killing them, he runs the risk of annihilating one of his own ancestors!

ANALYSIS
OF THE CASES OF
RHEUMATISM, AND OTHER DISEASES
OF JOINTS,
WHICH HAVE OCCURRED IN THE HOSPITAL DURING
THREE CONSECUTIVE YEARS.
WITH REMARKS ON THE
PATHOLOGICAL ALLIANCES OF RHEUMATIC FEVER.

By P. H. PYE-SMITH, M.D.

IN the hope of contributing to our knowledge of the pathology of rheumatism, I have collected all the cases which appeared to throw light on the subject from our hospital records of the years 1870, 1871, and 1872. During this time, as medical registrar, I saw all or nearly all these cases and revised the reports which were taken.

I have not entered upon the difficult and unsatisfactory subject of treatment, and, while not omitting other features of pathological interest, my chief object has been to contribute towards a more precise definition of the relation between genuine rheumatism and its supposed allies; gout, osteoarthritis and gonorrhœal synovitis. I have also availed myself of the aid of one of our senior students, Mr. Manser, who has with great care drawn up a series of tables founded on the hospital records of 128 cases of chorea, in the hope that these facts may help towards the elucidation of the difficult but important problem of the connection between this disease and rheumatic fever.

RHEUMATISM.

Excluding doubtful cases, I have abstracted over 300 of rheumatic fever, which were under treatment in the wards from 1870 to 1872 inclusive. To these I have added my own cases of 1873, those I have seen as out-patients, either at Guy's, or during four years at the Metropolitan Free Hospital, and others from my note books, so as to make up the round number 400.

All were examples of true rheumatism, that is to say, of the disease of which we have a well-known type in the acute febrile affection, with inflammation of many joints, and of the heart, as it occurs in a young adult. Taking a so-called sthenic case of this kind as the most characteristic form of the disease, it is easy to recognise varieties, according to the greater or less severity of the attack, until we arrive at cases where only one or two joints are slightly inflamed without pyrexia or other constitutional symptoms.

The pathology of some of these will be doubtful; but previous attacks of a more pronounced rheumatism or of chorea in the same patient, the existence of rheumatic fever or chorea in other members of his family, and his own subsequent history, will generally serve to distinguish even a very mild attack from traumatic synovitis, or the mere aches and pains which appear sometimes to follow exposure to cold or wet, without any synovitis or true rheumatic tendencies.

I cannot, however, see any good reason for distinguishing between an acute and a sub-acute form of the disease. We meet with every gradation of severity in practice, and the so-called sub-acute attacks are not exempt from liability to the cardiac complications which constitute the real gravity of rheumatism; so that the use of such a term as sub-acute rheumatism is apt to produce the same false security as that of "scarlatina." In children, rheumatism is usually mild, and its effect on the heart is almost constant.

Nor do I see any ground for recognising a synovial and a fibrous variety of rheumatism. It is said that in the latter "the inflammation commences in the immediate neighbourhood of one of the larger joints, not in the joint, but near it. It attacks the tendons, fasciæ, ligaments, and possibly also the muscles. At first there is not much redness or

swelling, but after the pain has been of some duration, there is puffiness around the parts affected, caused apparently by turgescence of the blood-vessels, and at length slight pitting or œdema may supervene, from effusion into the surrounding areolar tissue; and what redness is present is disposed in streaks following the course of the tendons."¹ The constitutional symptoms are said to be high fever with furred tongue, bounding pulse, profuse sweat, and high-coloured urine. Now these are the characters of every marked case of acute rheumatism; and the local signs given above are scarcely less so. Post-mortem examination has abundantly proved that the joint affection of rheumatic fever is a true acute synovitis, with effusion of serum, of fibrin, and occasionally even of pus, with minute injection of the lining membrane, and in fact all the appearances one could expect to find. The surrounding œdema, the slight pink and sometimes streaky blush, are no less characteristic and constant. But we have no evidence that rheumatism ever attacks tendons, fasciæ, ligaments, and muscles. The synovial sheaths of tendons may be inflamed in rheumatism, as they are in osteo-arthritis, but it seems doubtful whether the fibrous structure of a tendon is capable of acute inflammation. Again, we know what chronic inflammation of periosteum is in constitutional syphilis, and its symptoms and pathology are as different from those of rheumatic synovitis as cirrhosis of the liver from pleurisy. It happens that two of the structures attacked by rheumatism are in anatomical connection with fibrous membranes, but there is no reason to suppose that the latter participate in the synovitis or pericarditis any more than they do in simple traumatic inflammation of a joint, or in the pericarditis of Bright's disease or of pyæmia. We know now that the supposed acute rheumatic inflammation of the dura mater and arachnoid is no meningitis at all, but hyperpyrexia, and that the chronic rheumatic meningitis of the cord is not rheumatism, but interstitial myelitis. Moreover, the only other structures certainly affected by rheumatism, the endocardium and the pleura, have as little fibrous tissue as any membrane in the body. But if "fibrous" rheumatism is ordinary rheumatic fever with a wrong name, "synovial" rheumatism as described by authors,

¹ 'Sir Thomas Watson's Lectures,' 4th ed., vol. ii, p. 740. The description is taken from those of Dr. Chambers and Dr. Hawkins.

is a local synovitis with considerable effusion, which is not accompanied by endocarditis, or by severe pyrexia, and passes into a chronic stage, so as to allow of fluctuation being felt when the œdema has subsided. Such cases may be slight attacks of true rheumatism, but more often, as Sir Thomas Watson suggests, belong to the category of "rheumatic gout," (i.e. to a disease which is not rheumatism at all) or perhaps as frequently to gonorrhœal synovitis, which is equally removed from real synovial rheumatism.

The question whether we should extend the term rheumatism to the various chronic pains to which it is frequently applied, is a more difficult one. I am disposed to think that there is no pathological connection between rheumatic fever and the growing pains of youth, the muscular aches which often follow exposure to wet and cold in perfectly healthy persons, myalgia from simple fatigue, and the various aches and pains which make up the rheumatics of the aged. I do not deny that persons who have themselves suffered from rheumatic fever, or in whose family the disease is present, are occasionally liable to slight and passing pains, which may possibly depend upon a less degree of the same cause which produces the unmistakable effects. But it is far from proved, that these persons are more liable than others; and, in the absence of any objective symptom in such cases, we should, I think, be too readily accepting an easy and mischievous theory (because it can neither be proved nor confuted), if we ascribed them to a "rheumatic diathesis."

At all events, with our present knowledge, I think it best to admit for the purpose of this inquiry only those cases which are either well-marked examples of rheumatic fever, or examples of multiple synovitis occurring in those who in themselves or their blood relations have already suffered from the more typical form of the disease. Of course I have excluded all cases which appeared to be properly described as gout, or osteo-arthritis, or sequelæ of gonorrhœa, or of syphilis, or as dependent on any local cause. I very much doubt if there is any pathological connection at all between rheumatism and these various diseases. It is sometimes extremely difficult to distinguish them in practice, but mere similarity of symptoms is no ground for assuming a real alliance between diseases, and I

believe that there is no more reason for admitting a rheumatic gout or a gouty rheumatism than a rubeoloid scarlet fever or an enteric typhus.

The relation between true rheumatism and these other diseases which affect the joints I have attempted to make more definite by tabulating all the cases I could collect from our records during the years 1870-72 inclusive, so as to compare them with each other and with true rheumatism. These statistics, with the comments they seemed to suggest, will follow the present section of this paper.

Sex.—Of the 400 cases of rheumatic fever I have collected, 223 occurred in men and 177 in women. This proportion is about what has been generally observed, and seems to show that there is no predisposition to the disease in either sex, the greater number of male patients being explicable by their more frequent exposure to cold and wet. In this respect true rheumatism offers a striking contrast to gout and so-called gonorrhœal rheumatism on the one hand, and to osteo-arthritis on the other.

Age.—It has long been recognised that rheumatism chiefly attacks the young. The following table shows the ages at which the several attacks came on :

Years.		Cases.	Years.		Cases.
5.	First attack . . .	2	17.	First attack . . .	20
7.	First " . . .	3		Second " . . .	4
8.	First " . . .	4		Third " . . .	1
9.	First " . . .	5		Fourth " . . .	1
	Second " . . .	1	18.	First " . . .	24
10.	First " . . .	8		Second " . . .	13
11.	First " . . .	13		Third " . . .	7
	Second " . . .	1		Fourth " . . .	1
12.	First " . . .	13		Fifth " . . .	1
	Second " . . .	6	19.	First " . . .	23
13.	First " . . .	10		Second " . . .	11
	Second " . . .	2		Third " . . .	5
14.	First " . . .	23	20.	First " . . .	27
	Second " . . .	9		Second " . . .	10
15.	First " . . .	8		Third " . . .	6
	Second " . . .	5		Fourth " . . .	3
	Third " . . .	1	21.	First " . . .	14
16.	First " . . .	18		Second " . . .	6
	Second " . . .	8		Third " . . .	6
	Third " . . .	3			

Years.		Cases.	Years.		Cases.
22.	First attack . . .	20	37.	First attack . . .	2
	Second " . . .	6		Third " . . .	2
23.	First " . . .	14		Fourth " . . .	1
	Second " . . .	9	38.	First " . . .	5
	Fifth " . . .	1		Second " . . .	1
24.	First " . . .	11		Third " . . .	1
	Second " . . .	6	39.	First " . . .	3
	Third " . . .	2		Second " . . .	3
25.	First " . . .	13		Third " . . .	1
	Second " . . .	6	40.	First " . . .	6
	Third " . . .	5		Second " . . .	3
26.	First " . . .	13		Third " . . .	1
	Second " . . .	7		Fourth " . . .	1
	Third " . . .	4	41.	First " . . .	1
	Fourth " . . .	1	42.	Second " . . .	1
27.	First " . . .	7		Third " . . .	3
	Second " . . .	1		Fourth " . . .	1
	Third " . . .	3		Eighth " . . .	1
28.	First " . . .	12	43.	Second " . . .	1
	Second " . . .	6		Third " . . .	1
	Third " . . .	1		Fourth " . . .	1
29.	First " . . .	10	44.	First " . . .	1
	Second " . . .	2		Second " . . .	1
	Third " . . .	2		Third " . . .	1
30.	First " . . .	14	45.	First " . . .	2
	Second " . . .	4		Second " . . .	2
	Third " . . .	2	46.	First " . . .	2
31.	First " . . .	3		Fourth " . . .	1
	Second " . . .	4	47.	First " . . .	—
32.	First " . . .	7		Third " . . .	2
	Second " . . .	2	48.	First " . . .	2
	Third " . . .	1	49.	Second " . . .	1
	Fourth " . . .	3	50.	Second " . . .	2
33.	First " . . .	3		Third " . . .	1
	Second " . . .	4	51.	First " . . .	2
	Third " . . .	1		(one doubtful).	
34.	First " . . .	2		Second attack . . .	1
	Second " . . .	2	52.	First " . . .	1
	Third " . . .	2		Second " . . .	1
	Fourth " . . .	2	55.	Third or fourth attack . . .	3
35.	First " . . .	2	56.	Second attack . . .	1
	Second " . . .	3		Fifth " . . .	1
	Third " . . .	1	61.	First " . . .	1
36.	First " . . .	1		(doubtful).	
	Second " . . .	1		Second attack . . .	1
	Third " . . .	3	73.	Third or fourth attack . . .	1
	Fourth " . . .	3			

If we collect all the *first* cases in decades, they fall thus :

	Years.	Years.		Cases.
Ages	between 5 and 10	.	.	22
"	11 " 20	.	.	179
"	21 " 30	.	.	118
"	31 " 40	.	.	84
"	41 " 50	.	.	8
"	51 " 61	.	.	4

Thus, after a man has reached his 41st year without suffering from rheumatic fever, its occurrence becomes very unlikely. After the age of 48 there are only four cases of a first attack, and two of these were rather doubtful; one being complicated with delirium tremens, which ended in death, and the other being a slight case with no affection of the heart and scarcely any constitutional disturbance. The most dangerous years appear to be from 16 to 21.

The liability to return of rheumatism, when it has once been experienced, affects different ages in a somewhat altered degree, though here also the disease most often attacks the young. The earliest *second* case was at 9 years old, in a child first attacked four years earlier. Between 11 and 20 the number of second and third attacks gradually rises, reaching the number of 22 in the 19th, 16 in the 20th, and 19 in the 21st year. After 30 the second and more frequently repeated attacks begin to exceed the primary ones, and continue relatively more frequent throughout. But advancing age not only renders a first attack of rheumatism improbable, but reduces the liability to return of the disease in those who have already suffered from it. For the largest number of *secondary* cases in one year (22) falls between 18 and 19, and thence successive years show a diminution, thus—16, 19, 12, 6, 10, 8, 11, 12, 4, 7, up to 28; and 4, 6, 4, 6, 5, 6, 4, 7, 3, 2, up to 38; almost all of these numbers being larger than those of first cases in the corresponding years.

If we put together all the cases, whether primary or repeated, in decades, we find—

Analysis of Cases of Rheumatism

	Years.	Cases.
Under 11	. . .	23
From 11 to 20	. . .	277
„ 21 „ 30	. . .	200
„ 31 „ 40	. . .	80
„ 41 „ 50	. . .	28
„ 51 „ 61	. . .	12
At 73	1

Moreover, not only is rheumatism less frequent after than before the age of 30, rare after 40, and only occasionally seen when degenerative changes begin to appear, but the attacks which occur in later life are much less severe, and are seldom accompanied with cardiac inflammation. Thus, of those patients in whom an abnormal bruit was heard, only two were above 50, and in both of these the valvular lesion was due to a previous attack in early life. That this, however, like all pathological rules, is liable to exception, may be seen from the remarkable case to be mentioned more particularly presently, in which a patient who had suffered repeatedly from rheumatism as a young man, but had remained free from the age of 30, was again attacked at 73, and carried off by acute pericarditis.

Temperament.—I only admit this heading to protest against the survival in modern medical science of phrases which have lost their original meaning, have gained no other, and only serve to perpetuate inexact habits of thought. When physiologists believed that the fluids of the body were four—the blood, the bile, the black bile, and the phlegm; that these

“in quaternion run,
Perpetual circle, multiform, and mix
And nourish all things;”

and that each man's idiosyncrasies, liability to disease, and response to treatment depended, just as his mental temper depended, on a right mixture of these four elements, it was natural that physicians should lay stress on being able to find every man in his own humour. But when it was ascertained that the spleen is not the seat of melancholy, nor the pituitary gland of a catarrh, that a man of sanguine temper is not predisposed to hæmorrhage, nor an envious man to jaundice, then vaguer terms, as “lymphatic” and “nervous,” were introduced, and with them the doctrine of *mixed* temperaments, a favorite resort of ignorance unwilling to declare itself.

No one doubts that certain bodily conformations predispose to certain morbid changes. It may be that some people have larger and more numerous Peyer's patches than others, and therefore are more liable to enteric fever, or that precocious and excitable children are most prone to tuberculosis. Such questions need investigation, with all the help we can get from observations of race, of climate, of anthropology in its widest sense. But at present we are in the aphoristic stage of this science, and we only warp our observations by using a language which is as obsolete as that of astrology.

Nor do I think we can properly speak of a "rheumatic diathesis" or disposition. Tendencies which are never carried out can scarcely be recognised. All that can be meant by a man having a rheumatic diathesis is that if a hundred persons of the same "constitution" are taken, and a hundred quite different, there will be more cases of rheumatism among the former than the latter. Such an experiment has never been tried. All that is proved by the statistics I have here collected (and much larger ones published by other observers) is, that those whose parents have had rheumatism, and still more those who have had it themselves, are more liable to be attacked with the disease than other people.

We must assume that in some way the tissues of the former class are more vulnerable to rheumatic fever than those of the latter, just as a person who has had scarlet fever is less vulnerable than one who has not. But it is surely better not to use a technical word like diathesis to express so simple a fact. We might with equal propriety speak of every drunkard as having a diathesis of *delirium tremens*. Indeed, the word has been used in such different senses as to be misleading. Trousseau, following MM. Littré and Robin, defines it as "*une disposition générale en vertu de laquelle un individu est atteint de plusieurs affections locales de même nature,*" and adduces syphilis as a good example. But this is a very different thing from a *tendency* or *disposition* to a disease which has not yet appeared, recognisable by a certain conformation, as the supposed tubercular diathesis. And this again is different from the unknown condition which makes it more likely that a man whose father was gouty will have the gout than one who is free from hereditary taint. While protesting, however, against the use of the

term diathesis, it is of great importance to discover, as far as possible, by empirical observation, what are the antecedent conditions which are frequently found in those who are attacked by rheumatism.

That the attempt to discover true tendencies or dispositions to particular forms of disease is not hopeless has been shown by such brilliant examples as the discovery of the condition which tends to produce interstitial keratitis.

Careful observers have stated their belief that persons of fair complexion are more liable to rheumatic fever than others, and, indeed, that if an apparent case occurs in a dark person it will probably turn out to be osteo-arthritis. I have, therefore, noted the complexion in a good many instances, and while I have found plenty of patients with blue eyes and flaxen hair, and not a few of the still more pronounced xanthochroic type, with red hair, freckled skin, and clear grey eyes, I have also noted, in cases which had all the characters of true acute rheumatism, eleven with dark hair and eyes, two with a swarthy complexion in addition, and two with dark skin and hair, though the eyes were grey. In England the majority of the population are more or less xanthochroic; but there is no deficiency of rheumatic fever in Dublin, where the more frequent condition is dark hair and grey eyes, or in Paris, where the melanochroic variety of the Caucasian race, which predominates in the south of Europe, is more frequently met with than the "Saxon" or "Danish" type. In so mixed a population as that of England any difference of liability to disease could scarcely be explained by racial peculiarity.

Hereditary predisposition.—Though Cullen makes this character one which distinguishes gout from rheumatism, there can be no doubt that a tendency to rheumatic fever is inherited. In most of the cases I have tabulated, careful inquiry as to the family history was made, but a negative answer was unfortunately not always entered. If we strike off a fourth of the total number of cases to cover those in which the question may not have been asked, it will perhaps be a fair approximation to truth, and we should then have a statement of rheumatism having occurred in the patient's family in 23 per cent. of the cases.

The following is an analysis of the 68 cases in which the

patient asserted that one or more of his blood relations had been attacked by rheumatic fever.

One or both parents suffered from rheumatic fever in 45 cases, beside 6 in which the disease was only called "rheumatism," one in which the father had "gout," and two "rheumatic gout." It is worth mentioning that in 4 additional cases the father died of heart disease, and in one the mother was subject to the same complaint.

In 28 cases one or more brothers or sisters, or both, had been attacked with rheumatic fever.

In one case, beside the mother, her mother, and in another her sister, was affected.

In a single instance a child of the patient was stated to have already suffered from acute rheumatism.

Looking at these 68 cases from another point of view, in 45 of them only one of the blood relations was known to have been subject to the same disease, in 16 two were, and in 7 three.

Recurrence.—One of the most important characteristics of true rheumatism is its tendency to recur. It is certainly the exception for a person to suffer from it only once. The strength of this tendency was illustrated in a case of my own, in which a man who had been free from the disease from the age of thirty, and had not sustained any cardiac lesion, was at last attacked again at seventy-three, and died of acute pericarditis. But the fresh attacks are almost always of a frank and genuine character, and succeed at longer intervals as age advances, until they finally cease, without, as I believe, except in very rare cases, becoming chronic at all. In this respect rheumatism differs remarkably from gout, and also from osteo-arthritis, in the former of which the attacks become longer and more frequent (though less acute) as time goes on, while in the latter there is often a chronic and continuous march from the first, with only periodical exacerbations.

Relapse.—Besides recurrence after a longer or shorter interval of health, it is well known that patients convalescent from rheumatism are liable to sudden relapse, like that not unfrequently seen after enteric fever and erysipelas, but never, I believe, after typhus or scarlet fever. This disappointing event occurred fifteen times in the 400 cases on which this paper is

founded; but this probably does not represent the natural tendency to relapse, for (beside the cases of death) there were many more in which the patient insisted on leaving the wards too early for us to be sure that a relapse did not follow. Indeed, not unfrequently a person reappears with acute rheumatism who had only left the hospital a day or two before. In one case of my own, although I had been as determined or more so than usual in refusing the convalescent permission to eat meat or to leave his bed, he was again attacked twelve days after he had been allowed to get up, and three weeks after all pains had left him, and unfortunately died in this relapse, with fresh endocarditis and delirium.

Complications.—One almost doubts whether cardiac inflammation should not be counted an integral part rather than a complication of rheumatic fever. At all events, there are several joints of the body which escape more often than the heart.

In our 400 cases this organ was, of course, examined in all, and probably the statistics on this point are pretty nearly complete and fairly accurate. In more than half of the whole number (227) some cardiac murmur was heard while the patient was under observation. This melancholy result admits of some alleviation, it is true. In a large number of cases the mischief was the result of previous attacks, though it is often impossible to judge whether a murmur found on the patient's admission is due to the present or to a former attack. Secondly, the bruit observed not unfrequently disappeared before convalescence was established. This happened in most cases of pericarditis, and in not a few of endocarditis. I cannot, however, form an exact estimate of the proportion of cases in which a slight endocarditis passed off without leaving permanently damaged valves; first, because the excellent rule of examining the heart just before the patient's discharge, though very generally, has not been constantly observed; and, secondly, because it is certain that a patient who has apparently escaped mischief to his heart may be found with unequivocal signs of valvular disease when active work has put his circulation to the test; lastly, we must not forget that it is probable the muscle of a heart may be so damaged by rheumatism as to lead to subsequent dilatation of its cavities without the valves or pericardium being implicated. Such cases, however, which can only be recognised by subse-

quent symptoms and verified by post-mortem examination, are probably a very small percentage.

Subject to such considerations, the following are the statistics of cardiac affection found in the 400 cases.

Pericarditis	70		
" with large effusion .	4		
" with endocarditis .	17		
" with pleurisy . . .	5		
	<hr/>		
	96		96
Systolic bruit, audible at the base . . .	20		
" " " apex . . .	3		
" not stated or "præcordial" .	11		
	<hr/>		
	34		34
Mitral bruit, audible at apex and in axilla .		78	
Aortic systolic, diastolic, or to-and-fro bruit .		16	
Præcystolic bruit		3	
		<hr/>	
		97	97

Total number of cases with auscultatory evidence of cardiac affection 227

I have thought it best to separate the slighter, more local, and often transient murmurs heard in rheumatic fever from those which, by their persistence, localisation, and accompanying symptoms, can be referred with confidence to organic lesion of the valves. Of the former class, the twenty audible at the base were probably chiefly due to endocarditis affecting the aortic valves; but some may have been pericardial, and some, possibly, anæmic. I confess, however, to scepticism as to the frequent occurrence of murmurs due to the last cause in acute rheumatism; for in character they are not like the harsh aortic bruit of chlorosis, they are very rarely associated with venous murmurs, and the anæmia of rheumatism, though marked, is as much or more so during convalescence, when these soft systolic bruits have usually disappeared, as during the height of the attack, when they are first noticed. Moreover, it is not common to find a similar murmur in other diseases when attended with extreme anæmia, in phthisis, morbus Brightii, leucæmia, and blanching from hæmatemesis, menorrhagia, bleeding piles, or epistaxis.

Most of the eleven other cases entered under this head were, probably, of the same kind as the basic bruits just discussed, and the remainder slight and transient pericardial rubs.

Only three times do I find noted the presence of a slight but distinct bruit, systolic in rhythm, and audible only at the apex. It is very possible that these were cases of ordinary mitral regurgitation; but one should, I think, hesitate to affirm this diagnosis, when the murmur cannot be heard in the axilla, and disappears without leaving evidence of valvular insufficiency in the state of the cardiac dulness and impulse, in the pulse, or in general symptoms. Such bruits agree in physical characters with those heard in cases of chorea which have not been preceded by rheumatic fever, and these are confessedly of doubtful interpretation.

In the seventy-eight cases of mitral regurgitation I have included only those in which the bruit was audible at the angle of the left scapula, or at least in the axilla. In many there were the usual symptoms of dilatation of the three post-mitral cavities of the heart.

I have only found sixteen cases of undoubted lesion of the aortic valves. The number may, perhaps, be accidentally small, and I have already given reasons for believing that a large proportion of the thirty-one cases placed under the second head of the table would subsequently assume the characters of undoubted and permanent aortic disease shown, not only by the murmur itself, but by the condition of the pulse and left ventricle and by the general symptoms. Whenever a diastolic bruit was heard at the base of the heart I have admitted the case as one of organic disease of the aortic valves.

Lastly, three cases occurred in which a præ systolic bruit was heard at the apex, accompanied, in one of them, by an ordinary regurgitant mitral murmur.

Compared with pericarditis and valvular disease, all other complications of rheumatism are unimportant.

Eighteen cases of *pleurisy* occurred during the rheumatic attack. Of these three were double, and seven were combined with pericarditis.

I have never met with a case of rheumatic inflammation of the peritoneum, tunica vaginalis, or arachnoid, nor of the dura mater or sclerotic, and confess to scepticism in the supposed etiology of these affections.

With regard to the supposed dependence of certain *diseases of the skin* upon a rheumatic diathesis, as maintained by M.

Bazin and other French dermatologists, they include under the latter term cases of gout and other affections of the joints, which have no demonstrable connection with rheumatic fever. Whatever may be true of the alliance between gout and psoriasis or eczema, the only cutaneous affections which most English physicians would admit to have any pathological connection with rheumatism are certain forms of urticaria and erythema, and the remarkable lesion which is probably misnamed erythema nodosum.

I have not found record of any of these diseases having preceded the attack of rheumatism, but such a fact would be seldom inquired for, and still more rarely remembered. While in the hospital, however, one patient was attacked with urticaria, one with roseola, two with papular erythema (in one of them apparently the result of a copious eruption of sudamina), and two with erythema nodosum.

There were seven cases of *pneumonia*, a complication which, if not strictly accidental, may, perhaps, be placed in the same etiological category as the pneumonia of other fevers. Four of the seven cases proved fatal.

Other accidental complications, which it will be sufficient to mention, were phthisis in five cases; bronchitis, syphilis, and epilepsy, each in three; albuminuria (without cardiac disease) in two; and ophthalmia, mania, eczema, cystitis, and bed sore, each in a single instance. Gonorrhœa was present in two cases, but both had all the characters of true rheumatism, and one was a third attack with pericarditis, so that there could be no doubt of the diagnosis.

Predisposing causes.—Chorea is certainly one of these, or, perhaps, it should rather be regarded as an evidence of such predisposition. Among the 400 patients, however, only seven stated that they had previously suffered from chorea. One of these had had it twice, and another four times. The only other predisposing conditions I can see are inherited tendency and a previous attack. These have been already sufficiently discussed.

Supposed exciting causes, especially exposure to cold and wet, were very frequently mentioned by the patient. Many had no such explanation to offer; but patients know so much more of etiology than doctors, that it is very rare for them not to furnish us with a full account of the causes which

appear to be satisfactory to themselves. It is, however, probably true that getting wet through does sometimes determine an attack of rheumatism. Dry cold, draughts, wet feet, &c., appear to have no such influence.

Of the efficient cause of rheumatic fever I do not see that we have any knowledge at all. There is not sufficient evidence of its depending upon lactic acid, or, indeed, upon any condition of the blood whatever. We only know it by its effects, as a complex of symptoms—"sthenic" pyrexia, multiple synovitis, and cardiac inflammation.

As one step to understanding its pathology, we must try to group it with its natural allies, and separate it from those with which it has only an accidental connection; and it is one object of the present paper to contribute facts towards this result.

Results.—All the cases but eighteen recovered. The following is a summary of the fatal ones :

No.	Sex.	Age.	Attack.	Morbid conditions.
1	F.	31	Second	Heart unaffected; hyperpyrexia.
2	M.	51	First	Heart unaffected; delirium tremens; acute pneumonia.
3	F.	12	First	Pericarditis and pleurisy.
4	F.	16	First	Endocarditis and pneumonia.
5	F.	27	Third	Endo- and peri-carditis; acute pneumonia supervened.
6	M.	10	First	Pericarditis and pneumonia.
7	F.	4	First	Pericarditis and pleurisy, with recent endocarditis of aortic and pulmonary valves.
8	M.	33	First	Heart unaffected; temp. 103°; died in an epileptic fit; no organic lesion found.
9	M.	23	First	Pericarditis and pleurisy; temp. 108°; delirium.
10	M.	21	First	Peri- and endo-carditis; double pleurisy and pneumonia.
11	M.	20	Second	Old aortic lesion; recent pleurisy and endocarditis; temp. not above 100°; sudden death from syncope (?)
12	M.	43	Fourth	Old pericardial adhesion; recent endocarditis; diphtheritic angina supervened.
13	F.	11	First (?)	Pleurisy; pericarditis, with great effusion.
14	M.	24	Third	Apex systolic bruit; relapse; delirium; pericardium adherent, with recent endocarditis.
15	M.	32	First	Temp. 105·4°; pericarditis with hæmorrhage.
16	M.	20	Third	Ulcerative aortic endocarditis.
17	M.	12	Second	Pericarditis and pleurisy; recent endocarditis and acute bronchitis.
18	M.	73	Third	Acute pericarditis.

The total number of deaths is small (4·5 per cent.), and shows

how rarely rheumatic fever is fatal, even when the heart is severely affected. We shall see presently that three of the eighteen cases may fairly be called accidental, so that the true percentage would be less than 4.

Hyperpyrexia.—Three deaths occurred from this terrible complication. One was in the case of a woman aged 31, who had before once recovered from rheumatic fever. Another was in a first attack in a man of 23, accompanied with acute pericarditis and pleurisy. The third was in a case of my own, of which the following is a summary :

A man, *æt.* 24, of dark complexion, accustomed to drink wine freely, was admitted with a third attack of rheumatism. There was then found a systolic apex bruit, apparently due to former endocarditis. The temperature did not rise high, and in a fortnight he was free from pain, and wished to be up. I kept him in bed, however, some days longer, and only then allowed him meat. Twelve days after, he was apparently well. I let him go down stairs, and three days after this he "took cold," went to bed with a sore throat, and when I saw him next day was in a well-marked relapse of rheumatic fever, with slight pleurisy. The bruit was unchanged. This second attack was sharper than the last, but at the end of a fortnight he seemed again to be mending. The following is the table of temperature, pulse, and respiration, taken each morning :

					Temp.	Pulse.	Resp.
On the	6th day of the relapse	.	.	.	103°	140	40
"	7th	"	"	.	103°	136	44
"	8th	"	"	.	102.8°	120	36
"	9th	"	"	.	102.4°	126	39
"	10th	"	"	.	103°	120	43
"	11th	"	"	.	103.6°	120	50
"	12th	"	"	.	104.4°	—	—
"	13th	"	"	.	104.6°	114	54
"	14th	"	"	.	104.4°	120	50
"	15th	"	"	.	102.2°	130	48
"	16th	"	"	.	101.6°	114	54

I saw him that afternoon, and found nothing to explain the dyspnoea. The same evening he became delirious (he had never been so before), and next day "died in a fit."

On the evening of the sixteenth day of the relapse the temperature, I was told, rose considerably, but no note of it seems to have been taken, at least I cannot find any. But I think there is little doubt that it was a case of death by hyperpyrexia, and post-mortem nothing was found but an adherent pericardium and damaged mitral valve, evidently of long standing, together with slight recent endocarditis.

In this, as in the other two cases, I need scarcely say that no

lesion of the brain or its membranes was found. The temperatures noted in the 400 cases were not generally high; 104.8° , 105.4° are higher than usual. One only reached 108° , the second of the fatal cases of hyperpyrexia just recorded (No. 9).

Cardiac inflammation.—Six out of fifteen cases of death were due to acute pericarditis, beside two in which it accompanied pneumonia. In most of these it will be seen that there was also acute endocarditis or pleurisy, or both. As a remarkable case of acute cardiac inflammation at advanced age, I may quote the following particulars of the last on my list:

A gentleman, *et.* 78, who had suffered more than once from rheumatic fever when young, but had remained free since the age of thirty, was attacked again while laid up with bronchitis. Though an active man all his life, he had been frequently subject to attacks of spasmodic asthma, often accompanied with urticaria; and when I saw him about four years before his death, he had marked pulmonary emphysema and a feeble heart, with probable dilatation of the right side, but no sign of valvular disease. I saw him again when, already very ill with bronchitis, he was attacked with acute multiple rheumatic synovitis. There was then also no bruit to be heard, but though the pains subsided, he did not rally, and died a week or so afterwards with the ordinary symptoms of capillary bronchitis.

Post-mortem, the right side of the heart was found dilated, the lungs emphysematous, with the tubes dilated, filled with muco-pus, their mucous membrane granular and muscular coat hypertrophied; but there was also a coat of dry plastic lymph covering the whole heart, and forming soft, recent adhesions to the pericardium. The valves were practically healthy, and there was no sign of recent endocarditis.

With young persons, in whom rheumatic pericarditis is so much more frequent, it cannot be regarded as a very dangerous complication in itself; the remaining five cases of fatal pericarditis (without hyperpyrexia or pneumonia) were all that occurred out of 91 in which pericarditis was present. Two of them were accompanied with acute endocarditis and pleurisy, and two with pleurisy alone. They were all children under 18, except one, a man of 32, where there was bloody effusion in the pericardium.

Only one case occurred of ulcerative aortic endocarditis with "typhoid" symptoms.

Pneumonia.—This is one of the most frequent causes of death in rheumatism, though it seems to be rather an accidental complication than part of the disease, as we must regard the inflammations of the heart and pleura just referred to. Only

seven cases of pneumonia occurred in the total 400, but of these five proved fatal. In four of these there was also cardiac inflammation, and the last was complicated by delirium tremens.

Accidental causes of death.—Of the remaining cases of death one was the result of diphtheria, which appeared in the middle of the attack; another was from syncope, owing to previous rheumatic disease of the aortic valves; and the third was from a fit of epilepsy.

CHOREA.

Mr. Manser has collected from the records of our medical wards 128 cases of chorea. On looking through his reports, two of them, which were entered as doubtful, clearly appear to belong to those anomalous cases best described by Sir William Gull as “nervous vagaries.” Excluding these, and adding 24 other cases from my own out-patients, we make a total of 150.

Sex.—Of these patients, 42 were boys and 106 girls.¹

Age.—The first attacks were at the following ages:

Male. Female.				Male. Female.			
At 2 years old	. . 1 .	1 =	2	At 15 years old	. . 4 .	2 =	6
4 "	. . 1 .	0 =	1	16 "	. . 1 .	8 =	9
5 "	. . 0 .	2 =	2	17 "	. . 1 .	3 =	4
6 "	. . 1 .	6 =	7	18 "	. . 0 .	3 =	3
7 "	. . 0 .	7 =	7	19 "	. . 0 .	1 =	1
8 "	. . 3 .	11 =	14	20 "	. . 1 .	1 =	2
9 "	. . 6 .	10 =	16	21 "	. . 0 .	1 =	1
10 "	. . 5 .	13 =	18	22 "	. . 0 .	2 =	2
11 "	. . 1 .	7 =	8	25 "	. . 0 .	1 =	1
12 "	. . 5 .	11 =	16	26 "	. . 0 .	1 =	1
13 "	. . 4 .	5 =	9	38 "	. . 1 .	0 =	1
14 "	. . 3 .	2 =	5				

Putting apart the remarkable case in a man of 38 (of which particulars are given at p. 333, No. 4), it will be seen that only one first attack occurred as late as 20 in a male patient. All the rest were under 18, and the most frequent age for the first appearance of the disease was from 8 to 16 inclusive. In the female

¹ Of 531 cases treated in the Hôpital des Enfants Malades during twenty-two years, 393 occurred in girls and 138 in boys.—See M. Sée's treatise, 'De la Chorée et des Affections nerveuses.' Paris, 1851.

patients primary attacks were not rare between 19 and 26, but the most frequent age for them was between 6 and 12.¹

Taking the total number of attacks, whether first or not, we find they occurred at the following ages :

	Male.	Female.
Between 2 and 8 years old	3	16 = 19
" 8 " 14 "	35	94 = 129
" 14 " 17 "	15	27 = 42
" 17 " 21 "	5	13 = 18
" 21 " 27 "	2	5 = 7
Above 27	1	0 = 1

This table shows how the frequency of chorea increases rapidly after the seventh year is completed, attaining its maximum from 8 or 9 to 13 or 14, and thence slowly diminishing till about 20, after which the disease becomes very rare, except in the case of pregnant or puerperal women.

Recurrence.—This is so common that it may be considered characteristic of the disease. One young man had suffered from an attack every autumn from 14 to 22. A girl had been attacked each May from her 8th year to her 14th, when she came into the hospital. It was then October, the disease having appeared for the first time later than the spring of the year. Another girl of 13 had been subject to chorea for four consecutive winters, a third of the same age every spring during six years, and a fourth had also suffered in the spring of each year from 8 to 15 inclusive.

Distribution.—There were 33 cases of tolerably limited hemichorea, 15 right and 18 left, though in many of the remainder one side was more affected than the other. The movements began more often in the upper than in the lower extremities or in the face.

Condition of the heart.—In 11 cases there is no record on this point. Of the remaining 139 there was no bruit audible in 80. A systolic murmur was heard at the apex in 43 cases. A systolic murmur was heard nine times at the base, though in two of these it was not distinct, and in two of the remaining seven it was combined with a diastolic bruit. The remaining seven murmurs are described simply as "systolic."

¹ The statistics of the Children's Hospital in Paris (quoted by M. Sée) give in 191 cases of primary attacks—11 under six years old, 94 from six to eleven, 57 from eleven to fifteen, 17 from fifteen to twenty-one, and 12 above twenty-one.

The frequent bruit heard in chorea is a very remarkable and obscure symptom. In a large number of cases it is no doubt due to valvular lesion from previous rheumatism, and this I think will be found to be generally the case when the bruit is aortic, when it is audible in the back, or when there are signs of dilatation of the heart, local, in the pulse, or in the general symptoms.

The typical choreic bruit heard in cases uncomplicated by rheumatism has the following characters:

It is systolic in rhythm, audible at the apex, and more circumscribed in position than an ordinary mitral bruit. There are no other symptoms of cardiac disease.

After death small, delicate vegetations are found more or less regularly fringing the auricular surface of the mitral curtains, without other valvular lesion and without hypertrophy or dilatation.

This form of lesion differs therefore in important particulars from the familiar phenomena of rheumatic endocarditis, whether complicated by chorea or no. And on going over the 150 cases which have been abstracted, I find that, in the majority of cases in which the bruit had not what I would call the characteristic choreic features, there had been previous rheumatism. Thus of only eight cases in which a systolic apex bruit is noted as being audible in the axilla and at the angle of the left scapula, six had been preceded by rheumatic fever; and of the nine in which a basic murmur was heard, there had been previous rheumatism in five, and in one of the others the existence of the bruit was doubtful.

Again, excluding the cases in which the patient had already suffered from rheumatic fever, only 20 undoubted and two doubtful cardiac murmurs were found among 105.

At the same time we must not forget—(1) that there are exceptional cases of aortic murmurs, and even of pericarditis, in chorea, where there is no history of rheumatism; (2) that extensive valvular disease, with consecutive dilatation and hypertrophy of the heart and its ordinary effects in dropsy, &c., are sometimes found in apparently uncomplicated cases of chorea; (3) that children affected with undoubted mitral insufficiency after rheumatism rarely offer the well-known aspect and symptoms of the disease in adults; so that a patient under puberty,

suffering from cardiac disease, with pallor, emaciation, cough, dyspnœa, and hæmoptysis, looks much more like an adult with tuberculosis than like the waterlogged, jaundiced patient, with scanty and perhaps albuminous urine, who carries mitral disease in his aspect.

To what is the characteristic bruit of chorea due? If functional, on what disorder of the heart's action does it depend? If anæmic, why is it seldom or never heard in the place where the murmurs of chlorosis are invariably found, and why is it not accompanied by arterial and venous murmurs? If always organic, why are the other symptoms of mitral disease wanting, and why does it so frequently disappear? We may answer, first, that children with rheumatic endocarditis do not show some of the symptoms of cardiac disease seen in adults; secondly, that choreic endocarditis is usually seen as an acute affection, and at an early stage; and thirdly, that there seems no reason why, in some favorable cases, a few fibrinous beads, without thickening or contraction, should not be absorbed or washed away and leave the valve healthy again.

The results of post-mortem examinations, which I now proceed to give, confirm the view of the organic character of the choreic affection of the heart, and hence of its essential likeness to that of rheumatism.

Only four fatal cases occurred among the 150 tabulated, but I add seven others from my own note-book, which have not been published (Nos. 5—11).

1. F., *æt.* 13. Fifth attack of chorea. Never had rheumatic fever. Dark hair, sallow skin. Numerous bruises, and gangrene of one finger from jactitation. Ulcer under tongue, which was severely bitten. Pacchionian bodies large. Pia mater congested; amount of ventricular fluid much increased, but no sign of wasting or inflammation of the brain. Grey substance of cord dark and injected; but no induration or softening apparent. A fringe of firm, not easily removable growths around the mitral orifice; also two or three on the aortic valves. Peyer's patches large and healthy; liver, spleen, lungs, and larynx normal.

2. F., *æt.* 7. Excoriations on various parts of the body. Recent appearances of diphtheria on fauces and epiglottis. Skull and brain apparently healthy; the latter somewhat soft, and not congested. Cord somewhat softer than usual; pia mater pigmented; lungs practically healthy. Small vegetations on aortic valves, with a large adherent clot; mitral unaffected. Abdominal organs healthy.

3. F., age not stated. Three months pregnant; signs of rachitis. Skull thick; membranes adherent; brain hyperæmic, and flattened from excess of fluid

in ventricles; cord rather soft; thyroid enlarged. There was a fringe of vegetations on the mitral valve. Liver and kidneys normal.

4. M., *æt.* 38. Never had rheumatic fever or chorea. After a fright, two years before, had suffered from occasional jactitation and "nervousness." During the ten days he was in hospital got no rest except by chloroform. He died comatose. Cranial bones thick; large and numerous Pacchionian bodies; brain shrunken; ventricles distended; cord apparently normal; lower lobe of the lung congested; ecchymosis of pericardium. Minute bead-like vegetations on aortic valve; only a single large one found on the mitral. Kidneys normal.

5. M., *æt.* 10. No history of rheumatism, but erythema marginatum was noticed during life. Acute pericarditis without effusion; aortic and mitral vegetations. Acute pneumonia, with some recent pleurisy. The left ventricle was dilated, and the liver in an early stage of the "nutmeg" condition.

6. F., *æt.* 18. Brain normal; mitral vegetations.

7. M., *æt.* 12. First attack. No history of rheumatism; death from exhaustion; mitral vegetations.

8. F., *æt.* 20. Died, apparently worn out by constant jactitation. Brain and cord normal; vegetations on the mitral valve.

9. F., *æt.* 18. Brain normal; bead-like vegetations on mitral curtains.

10. F., *æt.* 16. Third attack. Never had rheumatism. Vegetations on the mitral valve, which was much constricted; extensive fibrinous growths on the aortic valves. All the cavities dilated, more or less hypertrophied. Lungs splenified; spleen hard; anasarca. Acute pneumonia, with pleurisy.

11. F., *æt.* 7½. Never had rheumatism. Brain normal; an adherent and decolourised clot in the basilar artery. Recent diphtheria. Vegetations on the aortic valves; mitral unaffected.

It will be seen that there are some exceptional cases in this small number of deaths. The fourth is remarkable for the age of the patient, and yet it appears to have been genuine chorea. The fifth and tenth show (if there really had been no antecedent rheumatism) how choreic endocarditis may produce all the hydraulic effects of ordinary valvular lesion from rheumatism. The second, fourth, fifth, tenth, and eleventh prove that the aortic valves may be affected, perhaps more often than the physical signs during life would lead one to suppose. In two of the cases the cause of death appears to have been the supervention of diphtheria; in two it was the result of organic disease of the heart, and acute pneumonia; and in the other six it was probably due to the terrible exhaustion of constant movement, without sleep or cessation, which neither chloroform nor any narcotic seems to avert.

It will be observed that there was evidence of endocarditis in every case. Indeed, I have only seen one autopsy in which this was not found.

Relation to rheumatism.—Whatever weight should be laid upon the differences between the cardiac affection of chorea and that of rheumatism, it remains as an important pathological link between the two diseases that they only, with pyæmia, produce acute endocarditis at all.

The second, and perhaps still more essential, fact is the frequency with which they both occur in the same family or the same individual. In by far the majority of cases it is rheumatic fever which precedes chorea. Thus, we have seen that in our 400 cases of rheumatism only seven were reported as having previously suffered from chorea; while of the 150 cases of chorea forty-two had already been attacked by rheumatism,¹ and in three cases rheumatic fever appeared while they were under treatment. M. Sée found sixty-one cases of rheumatism in 128 of chorea, and the former disease had preceded the latter "in the immense majority of cases."

Among Mr. Manser's 126 cases there was a history of rheumatic fever in the family only four times, but in seventy-four cases no inquiry on the subject had been made. That the proportion is really larger seems shown by eighteen consecutive cases of chorea among my own out-patients, in three of which the father and in two the mother of the child had suffered from rheumatic fever. In a sixth case the mother was said to be subject to "rheumatism," but from the description given it appeared to be really osteo-arthritis.

On the other hand, though it is common to find chorea in a brother or sister of the patient, it is comparatively seldom that one is told of the patient's father or mother having been choreic in their youth.

¹ In one case, that of a girl, twelve years old, she was said to have had "rheumatic gout" six weeks before her attack of chorea. Though there was no bruit, her age, and the fact of her father having suffered from "rheumatic fever," seems sufficiently to show that her case was really rheumatic. I therefore included it with the rest. The mild character of rheumatic fever, as a rule, in children, makes it probable that its previous occurrence is often overlooked or forgotten in cases of chorea; while, if a child has had rheumatism, its heart is almost certain to have been affected.

GOUT.

During the three years 1870-72 I have notes of 61 cases of this disease.

Sex.—Of these, 54 occurred in men, and 7 in women. The ages of the latter were, 20, 35, 35, 50, 20, and 22. Among these seven patients, there were only three with previous gout in the family. Of the others, one was a cook, who admitted she drank port wine, another a charwoman, and a third was a beer-drinker. As an example of severe gout in a young woman, I may quote the following case, which is now under my care.

C. J., *æt.* 22, married. Father and one of his brothers subject to gout; no other relation. The father came with her, and showed me his hands crippled with tophi. First attacked herself about a year ago. The great toe-joint is enlarged, red, and cedematous, with dilated veins. There are also several tophi in her ears. At different times she has suffered from the disease in the hands, where gouty concretions have already formed, and also in the other foot, elbows, shoulders, and knees. The heart and lungs are normal. The urine is slightly albuminous, with *sp. gr.* 1022. The spleen is enlarged and tender, without history of ague. The uterus is anteflexed and the cervix elongated.

Age.—The youngest patient was 20, the oldest 78.

Under 30	.	.	.	.	.	.	.	4
Between 30 and 40	.	.	.	.	.	.	.	22
„ 40 „ 50	.	.	.	.	.	.	.	14
„ 50 „ 60	.	.	.	.	.	.	.	13
Above 60	.	.	.	.	.	.	.	8
								—
								61

If, however, we tabulate the ages at which the disease first attacked these patients, according to their own account (and the first fit of gout is not likely to be forgotten), we find that it showed itself—

Between 20 and 30 in	.	.	.	.	.	.	.	7
„ 30 „ 40	.	.	.	.	.	.	.	28
„ 40 „ 50	.	.	.	.	.	.	.	11
„ 50 „ 60	.	.	.	.	.	.	.	8
„ 60 „ 65	.	.	.	.	.	.	.	5
At 70	.	.	.	.	.	.	.	1
								—
								60

Family History.—This was probably inquired into in every

case, and in 21, a third of the number, there was more or less satisfactory evidence of gout in near blood relations. In seven it had previously attacked two members of the family; in one three, the grandfather, mother, and a brother, "who was a painter;" and, in another, the father, grandfather, and three brothers had all suffered. Among the twenty-one families—

A grandfather suffered in	4
Grandmother "	1
Father "	11
Mother "	4
Brother "	10
Sister "	1
Uncle "	8

In three instances the disease in the relative was called "rheumatic gout." This term, when used without medical suggestion, I find generally means true gout. Osteoarthritis is called "rheumatism" by the laity.

Drink.—Only seventeen patients confessed to have drunk freely. Of course this represents very inadequately the number who probably owed their disease to this source. But, apart from the powerful influence of hereditary tendency, it may be questioned whether alcoholic intemperance is so frequent a cause of gout as is often assumed. Its comparative rarity among the lower classes in London who drink so largely of porter, and its practical absence in Dublin, and among the whisky-drinking population of Scotch manufacturing towns, is remarkable; and it is probable that, while excess in food no less than in drink may produce it, active exercise may retard or prevent the effects of intemperance. The large consumption of beer and Rhine wine in Germany does not seem to engender gout to a large extent; so that Dr. Pagenstecher¹ speaks of it with respectful envy as the heritage of "die reichen Söhne des gesegneten Albions."

Plumbism.—I only found evidence of lead poisoning in two cases; and have never met with gout from this cause without hereditary predisposition or intemperance. I do not find that painters and plumbers admit the common opinion that men in these trades drink more freely than others.

Albuminuria.—The chronic interstitial nephritis which pro-

¹ 'Gicht und Rheumatismus,' 1872, p. 7.

duces what Dr. Todd called the "gouty kidney" is probably a common result with gout of intemperance. Albuminuria was present in seventeen cases; in another, where it was absent, the kidneys were granular and contracted after death, and in two cases there was eclampsia, apparently of renal origin, so that this affection probably existed in at least a third of the cases.

Arterial disease.—In two cases there was an aortic bruit, probably due to atheroma of the valves, and in three others evidence of degeneration of the smaller arteries was found. In one there was an intermittent pulse, in another retinal hæmorrhage, and in two others hemiplegia, apparently due to cerebral hæmorrhage.

There were only four cases of "gouty bronchitis" noted.

Connection with rheumatism.—No less than thirteen patients stated that they had previously suffered from acute rheumatism. In most cases this was probably an early attack of gout. Thus, a man of 48, with albuminuria, and tophi in his ears, says he had "rheumatic fever" at 38; another of 64, long subject to gout, as were his grandfather, mother, and a brother, says it began with "rheumatic fever" at 32. There can be no doubt that this is also the true interpretation of the following case:

A man, now 54, with well-marked gout of the knees and toes, says he had rheumatic fever at 44. But on being further questioned, he says that his ankles only were affected, that the skin was tight and shining, and that he did not sweat.

Another man, 59 years old, whose brother was subject to gout, and who has bad arteries and albuminuria, says that his present obviously gouty condition began with an attack of "rheumatic fever" eight weeks before.

It is worthy of note that in none of the thirteen cases had the supposed rheumatism left any trace upon the heart.

On the whole, I do not think there is evidence of sufficient weight to make us believe that persons who have suffered from rheumatic fever (or from "chronic rheumatism") are more likely than others to be attacked by gout, or that rheumatism and gout "run in families." That there is nothing in rheumatism to *prevent* a man having gout is shown by the following instance:

A man, now 52, came to me as an out-patient with unmistakable gout. His father and grandfather had both suffered from the same disease, and he had

fostered his hereditary bias by free drinking. He said that he had rheumatic fever when 13 years old, without any return of the disease; and when, at 36, he was first attacked by gout, the pain and the course of the disease were entirely different. There was no bruit in this case.

From this patient's account I am inclined to think that he really had rheumatism when a boy. But such cases only prove that the two diseases are not antagonistic; that, indeed, they have no pathological relation to each other.

Tubercle.—It has been supposed that gout, like cancer and heart disease, is antagonistic to phthisis. The last effect is probably explained by the fact that any cause of chronic congestion of the lungs and diminished aeration of the blood is antagonistic to rapidly spreading inflammation and to caseous decay. The other two may be in great part due to gout and cancer usually affecting patients at a later period of life than phthisis. At all events, exceptions may be found, and I have met with three cases of phthisis occurring in a gouty subject.

The first was a man of 60. He came to me in 1867, at the Devonshire Square Hospital, with tophi in his ears and gouty inflammation of his fingers and toes. He had two brothers who were gouty, and his urine contained albumen. This patient had cough, hæmoptysis, and other signs of phthisis.

The second was an out-patient of mine in 1868. He had lived freely, and well-marked gout appeared during the progress of ordinary chronic phthisis.

The third, a man aged 48, a waiter, was lately under my care in Guy's Hospital. He had a phthisical aspect and marked signs of consolidation of both apices. He also had several times suffered from gout, and had a fit of it while in the ward. His father died of consumption at 54; his mother about the same age, of "asthma." He himself suffered from fistula, and for years had been subject to cough, with emaciation, pallor, and occasional hæmoptysis. After signs of a cavity in one apex had appeared, he had a second attack of gout in the foot.

Beside these three patients, it will be seen that the autopsy showed, in the second of the following cases of death, that there was tubercular phthisis, though not in active progress; indeed, it had not caused symptoms during life.

Fatal cases of gout.—There were seven of these during the

three years, and to these I may add three others from earlier notes (Nos. 8—10). All were men.

No.	Age.	Cause.
1	58	Acute pericarditis and pleuro-pneumonia. Granular kidneys.
2	39	Albuminuria; severe diarrhoea.
3	46	Uræmic eclampsia and coma.
4	50	Albuminuria. Pleurisy and pneumonia.
5	47	Cancer of œsophagus, opening into lung.
6	59	Cancer of ribs, vertebrae, liver, &c.
7	38	Albuminuria. Cerebral hæmorrhage; coma.
8	38	A painter, who had suffered from lead colic, and had drunk hard. Granular kidneys; hypertrophied left ventricle; red softening of left corpus striatum.
9	54	Granular kidneys; hypertrophied and dilated heart; acute uræmic pericarditis.
10	60	Granular and cystic kidneys; bad arteries; large cerebral hæmorrhage and coma.

Two of these patients died from malignant disease, unconnected with gout except by its preference for the same period of life. All the rest had granular degeneration of the kidneys. In the first case there was also atheromatous disease of the aortic valves and bad cerebral arteries. The latter had produced hemiplegia before the case was cut short by (renal) pericarditis and pleurisy, with pneumonia. The pleurisy and pneumonia of the fourth case were also the result of a similar condition of kidneys.

In the second patient, who is reported to have lived a steady life, but to have suffered much from "rheumatism," the diagnosis made during life was established by finding abundance of gouty deposit in the great toe-joints and knees. The immediate cause of death was gastro-enteritis, leading to a remarkable phlegmonous condition in the colon, with sub-mucous furunculoid abscesses and ulceration. This is the nearest approach to the traditional "gout in the stomach" that I have seen. The kidneys were granular and much wasted, with deposits of urate of soda. The arteries were "very bad," but there was no cerebral hæmorrhage. The heart weighed 15 oz., but, except for hypertrophy of the left ventricle, was healthy. There was an old vomica towards the back of the apex of the right lung, with much cicatricial tissue and a few clusters of recent tubercles, and the left apex also contained traces of tubercle.

In the third case both kidneys weighed only five ounces together. It was remarkable that while in the hospital this

patient was attacked with diphtheria and recovered, though he was before suffering from gout and albuminuria.

The seventh case was equally characteristic, the bad arteries and hypertrophied left ventricle of chronic renal disease leading to cerebral hæmorrhage, as in No. 1.

In the second case, which was one of unmistakable gout, both clinically and anatomically, the patient said that he had an attack of rheumatic fever a year before his admission. This was almost certainly acute gout. Indeed, gout is rarely claimed by the poor, and is probably much more common among them than is generally supposed. I have seen it in a young lighter-man, who drank heavily and had been exposed to wet, accompanied with much fever, profuse sweats, high coloured urine, and other symptoms, simulating acute rheumatism. But the heart remained unaffected, and the inflammation finally settled in the great toe, when it assumed the characteristic hyperæmia, œdema and subsequent evolution of gouty arthritis.

It is probable that in classical and mediæval times, not only such cases, but almost all of acute rheumatism, were called *chiragra*, *gonagra*, *omogra*, &c., for we find little mention of rheumatism, except as a humoral explanation of various pains and aches, before the time of Sydenham. At the present day, in Germany, "*Gicht*" is popularly credited with all the pains which are called "*rheumatics*" in England. Sometimes *Gicht* is nothing but bad corns, and is rarely true gout. I only saw one case of this disease among sixty-four post-mortem examinations in Vienna; and though this was an "*exquisite*" example, no one recognised it but Professor Rokitsky himself.

At the same time one can scarcely suppose that many accounts of the disease among historical personages on the Continent can refer to anything but true gout, especially when these patients were advanced in age, and sometimes bore the same distortions and chalk-stones which were familiar to the ancient Romans. Why Falernian should produce gout as easily as port or ale, and why Bavarian beer should not, is a difficult question. But we cannot doubt that the Emperor Charles V¹ and his daughter the Duchess of Parma, Erasmus, Richelieu,

¹ From the accounts of his illness, in Mr. Stirling's '*Cloister Life*,' it is not difficult to follow the symptoms of gouty bronchitis with atheroma, dilated heart, and renal and cardiac dropsy.

and Charles VII. of Bavaria, had as genuine experience of the disease as the ladies of the Roman Empire or an ordinary English peer.

GONORRHOEAL SYNOVITIS.

I use this name as a convenient one to distinguish the curious affection of the joints known as "gonorrhœal rheumatism" from true rheumatism, with which I believe it has no connection whatever.

I have only notes of twenty-nine cases, for most of them appear among the surgical out-patients.

The patients were all men, and I have never seen or heard of the disease in a woman. It is difficult to see why gonorrhœal urethritis, when it occurs in women, should not sometimes produce synovitis. May we compare this anomaly with another, that women are not liable to the same rigors and "urethral fever" which not unfrequently follow the passage of a catheter in men? and may both results be connected with a richer supply of nerves to the urethral mucous membrane in the one sex than in the other?

Age.—One patient was 18 years old and two were 19. Nineteen were between 20 and 30, six between 32 and 39, and one was 41.

Locality.—It is well known that this disease affects by preference the feet and knees, but it is not rare to find it in the upper extremities also, though the fact is denied by Niemeyer. In the twenty-nine cases here tabulated the feet were affected in more than twenty, the ankle, sole, heel, and instep being the parts in which pain was most usually felt; the knee was inflamed in fourteen cases, the wrist in six, the shoulder in three, the hip and elbow in one each. The toes were often painful, but not the fingers. The pain was usually worse at night, and was always described of the same dull, constant, aching character. There was in most cases moderate œdema, and occasionally a slight inflammatory blush, as well as local heat. I have only seen marked effusion in the knee, but suppose the other joints to be affected with a synovitis of the same kind. Except for the nocturnal exacerbation of pain, I do not know any symptom which points to implication

of fasciæ or other fibrous tissues, and I have never seen evidence of periostitis.

Complications.—There was a systolic basic *bruit* in one patient, a man 24 years old. His father had been subject to “rheumatic gout,” and three years ago he was himself ill for twelve months after an attack of gonorrhœa with “rheumatism” affecting the feet and knees. At the time he was under observation the synovitis affected the feet and knees, and it afterwards attacked the shoulder, the urethral discharge not having quite disappeared. He went out “relieved” after three months’ stay in hospital.

The reputed coincidence in this case of synovitis with gonorrhœa, the parts it affected, and its obstinacy, seem to show that it was not true rheumatism. But to what was the cardiac murmur due?

The differences between the two diseases are too great, it appears to me, for us to admit that they are varieties of the same condition, and I do not know any clear case on record of peri- or endo-carditis depending on “gonorrhœal rheumatism.” It is possible that the *bruit* was functional, especially as there were no symptoms of organic disease of the heart. At all events this case was very different clinically from the two included above among those of true rheumatism, where gonorrhœa was present, but as a mere accident, not modifying the course of the more important disease in the least.

The *urine* was free from albumen and sugar, except in one case in which transient glucosuria was twice observed.

The only secondary lesion I have seen which appeared to be more than accidentally connected with gonorrhœal synovitis is inflammation of the *eye*. I do not refer to gonorrhœal ophthalmia produced by contagion, nor to simple iritis as in secondary syphilis, but to a general inflammation, which usually begins by slight pain and watering of the conjunctiva, then affects the sclerotic, and not unfrequently the iris also. I have not seen pus secreted, and the inflammation always subsided in a few days under treatment by cold bathing, covering from light, and applying atropine drops. This affection occurred in seven of the twenty-nine patients under observation, and more than once returned after having disappeared. One eye was usually affected at first, the other sometimes following it in a few days.

Perhaps the most characteristic appearance is the injection of the fine radiating vessels of the sclerotic which form a ring round the cornea. Rheumatic iritis and rheumatic scleritis have often been described, but I have never seen the eye inflamed in an ordinary case of rheumatic fever, nor in a gouty patient, nor in one suffering from typical osteo-arthritis.¹

Four of the cases were complicated by a history of previous syphilis, though, on the whole, the pains in the limbs seemed rather to depend on synovitis than on periostitis.

Relation to gonorrhœa.—The pains began in three cases a week after the appearance of the discharge, in one three, in two four, and in two six weeks after. In three cases they only appeared after nine months, and in the remainder (when this point was noted) at intermediate times. In a few cases there was still free discharge, but in most it was diminished in quantity and severity of symptoms, or even reduced to a slight gleet, the existence of which was usually denied by the patient, and only ascertained by inspection. Once established, the affection of the joints seemed to be independent of that of the urethra, and I could not observe any constant relation between them, either direct or inverse.

Previous attacks.—Though characteristically rebellious to treatment, this disease does not appear to return when once cured (or rather recovered from), unless a fresh gonorrhœa is incurred, but then a previous attack forms no protection against a second. Among the twenty-nine patients four gave a history of a previous similar attack following gonorrhœa, and one man of thirty-six had twice suffered in the same way before—at twenty-nine and thirty-two.

Relation to rheumatism and other arthritic diseases.—The limitation of gonorrhœal synovitis to the male sex, its slow and obstinate course, the absence of fever, its different distribution, its different sequelæ, and, above all, its remarkable dependence on a urethral discharge, seem sufficiently to distinguish this remarkable disease from true rheumatism. Nor is this a mere pathological refinement, for if we can tell a patient suffering from it that there is absolutely no danger to life, that he is not liable to disease of the heart, that his recovery will be very slow

¹ In Sir Astley Cooper's case of gonorrhœal rheumatism, one of the earliest on record, there was this complication present.

but very certain, that he will never suffer from it again except by his own fault, that he will not transmit it to his children, and that his life is as safe for insurance as it was before, he will see the practical importance of an accurate diagnosis, and will, perhaps, admit that medicine is a valuable art, independently of therapeutics.

Those pathologists, however, who believe in an arthritic diathesis suppose that the two diseases, though different, are allied—that a man who has himself suffered from rheumatism or from gout is more likely than another to suffer from synovitis if he contracts a gonorrhœa. This is a question which can only be answered by a very large number of carefully directed observations.

Of my twenty-nine patients three stated that they had suffered previously from rheumatic fever, which had, however, left no trace upon the heart.

The following were the family histories bearing on the point :

1. Father had rheumatic fever and grandmother "rheumatic gout."
2. Father was "rheumatic."
3. Father had the gout.
4. Father had "rheumatic gout."
5. One sister suffered from rheumatic fever and one from rheumatic gout.

Perhaps these are not more instances than would be explained by mere coincidence in the case of so common a disease as rheumatism among the poor. But satisfactory evidence on points of this kind can scarcely be expected from hospital records.

It is not improbable that in the most obstinate cases of gonorrhœal arthritis the ligaments and cartilages may undergo to some extent the same changes as those which occur in osteo-arthritis, and which, indeed, I once noticed in a gouty knee. I have no anatomical evidence of this surmise, for I have never dissected a joint affected with gonorrhœal inflammation, but the following case is one of those which lend it some support. I need scarcely observe that a more or less perfect coincidence of structural changes does not imply an identity of the process which led to them, any more than we can assume tubercle, cancer, and inflammation, to be the same because they may all furnish the same caseous product. I should rather imagine

that part of the conditions seen in osteo-arthritis are not specific, but simply dependent on the duration of non-suppurative inflammation of the joint, and would follow true rheumatism if it ever became sufficiently chronic, or an accidental injury if not too severe and kept up sufficiently long.

H. W.—, *æt.* 29, came to me as an out-patient, complaining of pain in the elbows, shoulders, ankles, and soles of the feet. There was little or no swelling, and no redness or heat. He was unable to walk, so I took him into the hospital and treated him for gonorrhoeal synovitis. He had never had rheumatism, nor had any of his family. The heart and other organs were healthy. The pains had come on a few weeks after the discharge appeared. There was no gleet remaining. There was a doubtful history of constitutional syphilis, and the pains were worse at night; so, as he did not improve, I gave him ten grains of iodide of potassium thrice a day for some time. This did him no good. He was then attacked with inflammation of one eye, and characteristic injection of the sclerotic followed by mild iritis. This subsided (without mercury), as did a similar but less severe affection of the other eye. Meantime the pains had become more fixed in the feet, especially in one great toe, and one shoulder. As the latter was stiff and painful, I had him twice put under chloroform, and the adhesions forcibly broken down. Sugar was twice found in the urine, which was not more copious than natural. At last he went out with his feet still stiff and painful. The only drug which seemed to do him any good was iodide of potassium in scruple doses three times a day, and that was only for a short time. Several months later he came to me again. The feet were not quite well, and the shoulder was stiff, with a wasted deltoid. The eyes were perfectly well, and there was no cardiac irregularity.

OSTEO-ARTHRITIS.

This curious disease appears to have been first recognised by Sydenham. He says that rheumatism, when free from fever, is often called arthritis (*i.e.* gout), though really distinct from it:—*“Unde forsā petenda est ratio cur tam sicco illum pede transiverint scriptores medici: nisi forsā arbitremur hanc morbi speciem ad reliquam malorum Iliada de novo accessisse.”* He goes on to describe the chronic course of the disease, with its remissions and exacerbations, and concludes his description as follows:—*“Fieri potest ut æger omni membrorum motu ad mortem usque privetur, digitorum articulis quasi inversis, et protuberantiis, ut in arthritide, nodosis, in interna magis quam externa digitorum parte se prodentibus: stomacho nihilominus valeat, et cætera sanus vitam toleret.”*¹ Since that time the affection has been described by Dr. Haygarth as “nodosity of

¹ ‘Obs. Med.,’ sec. vi, cap. 5 (p. 256 of Syd. Soc. Ed.).

the joints," by Cruveilhier as "arthrite avec usure des cartilages articulaires," by other French writers as "arthrite sèche," by German pathologists as "arthritis deformans," by many English authors as "rheumatic gout," by Dr. Adams in his beautifully illustrated monograph as "chronic rheumatic arthritis," and by Dr. Garrod as "rheumatoid arthritis." It is also supposed to correspond to the poor man's gout (arthritis pauperum) of older writers; but true gout is far from uncommon among the poorer classes of this country, so that the name was probably never very applicable. Objection may be made to all the names I have enumerated, and it is perhaps best for us to adopt the term *osteo-arthritis*, which is that applied in the "nomenclature of diseases" issued by the College of Physicians in 1869. There is no object in adding the adjective "chronic," for one often sees the affection in an acute or subacute stage, and the chief advantage of the new term is that it is distinctive and a single word.

Sex and age.—I have notes of only 29 cases of osteo-arthritis. Of these, 8 occurred in men and 21 in women. The youngest patient was 19, the next 24. One at 27 had suffered for seven, and another at 30 for five years. Two were 31 years old. One at 32 was first attacked at 29. Then comes one at 34, two at 39 (one ill for five years), four between 44 and 46 (one ill for five years), four at or about 50, two at 52, and two at 56. Five patients were 63 years of age, one 65, and another 67. Lastly, three were aged 70, 71 and 72 respectively.

Even this small number of cases suffices to show two of the characteristics of the disease—that it is more frequent in women than in men,¹ and that it affects all periods of life from puberty to old age. Two points, however, I think I have noticed—first, that the early cases almost always occur in women; and, secondly, that they are more often found attacking the fingers, hands, and other joints, with considerable pain and swelling; while the more chronic cases, which affect one hip or one knee, are more common in old people, and especially old men.

¹ In Dr. Adam's Monograph (Ed. 1872), however, of twenty-one cases only five occurred in women. The ages were, 27—30, two; 30—40, five; 40 to 50, five; 55, one; 60, three; 74—82, five.

Distribution.—The following were the joints affected :

	Cases.		Cases.
Fingers . . .	17	Shoulders . . .	8
Knuckles . . .	4	Hips . . .	8
Wrists . . .	14	Knees . . .	18
Hands generally . .	8	Ankles and feet . .	12
Elbows . . .	7	Vertebrae . . .	1

The fingers were the *first* parts attacked in eleven cases, and other joints of the hands in five ; the elbow and shoulder in two each.

The hip was attacked first in one case, the knee in four, and foot in three.

So that the hands are generally attacked first, and suffer most severely, the knees coming next, and then the feet.

Relation to rheumatism and gout.—This distribution differs from those of rheumatism and gout, almost as much as the course the inflammation follows or the anatomical changes it produces. I have never seen undoubted rheumatism produce distortion or deformity of any kind, unless the occasional persistence of effusion in a knee-joint be counted as such. I have, however, once observed, in a case of unmistakable gout that the edges of the patella were enlarged and thickened very much, as in osteo-arthritis. There was here no eburnation of the surface, and urate of soda was present in the cartilage.

Beside the characteristic local lesions, the peculiarities as to sex and age, the chronic course of the disease, its distribution and its reaction to remedies, the most conclusive proof of the pathological difference between osteo-arthritis and either gout or rheumatism is the absence of the secondary lesions which are so characteristic of each of the latter diseases.

In none of the cases I have seen was there any cardiac complication or pleurisy, however early they occurred ; in none was there albuminuria or the other frequent concomitants of gout. It has been supposed that osteo-arthritis predisposes to consumption ; and if so, this would tend in the same direction, for phthisis has probably no relation to rheumatism and is antagonistic to gout. Among the twenty-nine cases, phthisis was present in three. In the first, it began with chronic bronchitis and emphysema, went on to ulceration and hæmoptysis, and ended in death. In the second, there was dulness and bronchial

breathing at one apex, without hæmorrhage. The third was a remarkable case of tubercular phthisis of both lungs occurring at the age of 72.

I have never seen any other affection of the head, the chest, the eyes, or any other organ, that could be associated with osteo-arthritis.

While, however, most pathologists admit the distinction between osteo-arthritis and the two diseases with which it was formerly confounded, not a few consider that they form a natural group or family. But if each differs from the other two in ætiology, pathology, clinical features, sequelæ, and alliances, it would be strange if they should be found to replace each other in the same individual at different periods of life or in different individuals who partake of the same hereditary "constitution."

I have attempted to help towards answering this question, as far as my materials allowed, with the following results.

In six cases no mention of any previous attack of inflammation of joints was made, and in seventeen it was expressly denied. The statements of the six other patients were as follows :

- | | | |
|----|---------|-------------------------------------|
| 1. | Age 53: | had rheumatic fever at 4 years old. |
| 2. | " 44 | " when a child. |
| 3. | " 44 | " at 20, 27, and 43 years old. |
| 4. | " 39 | " 31 and 35 years old. |
| 5. | " 72 | " 30 years old. |
| 6. | " 50 | " 49 " |

The long interval in the first, second, and fifth cases, with the absence of any evidence of cardiac lesion, renders the accuracy of the patient's diagnosis somewhat doubtful. In the sixth the previous attack was pretty certainly of the same character as that from which he was suffering when under observation. But in the third and fourth there seemed no reason to suppose that the previous attacks had been anything but true rheumatism, except on general grounds of the difficulty of diagnosis and the absence of any affection of the heart.

With respect to the family history, twelve patients said that none of their relations had suffered from any affection of the joints, nine gave no information on the point, and seven made the following statements :

1. Father had rheumatic fever.

2. Father had rheumatic fever. Mother was subject to "rheumatics." Sister had "the chalky gout."

3. Father was "rheumatic."

4. Sister had rheumatic fever.

5. Sister died of rheumatic fever at 57, a brother has had the same disease, and another brother died of disease of the heart.

6. Father had gout in the great toe,

7. Grandmother had the gout.

A much larger number of cases are, of course, necessary in order to form anything like a safe conclusion on this subject, and the only satisfactory data would be those founded on actual observation; for a patient's memory is so fallacious and his use of terms so loose that we cannot be sure of being even near the mark in drawing conclusions from them. Moreover, we must not forget that the frequency of rheumatic fever among hospital patients would account for a certain number of cases by mere coincidence.

I have already suggested that though osteo-arthritis may be separated pathologically from other diseases, yet that it is not the only condition which can produce some of the anatomical changes in the joints which are its result. Just as it may be maintained, that while the chronic interstitial nephritis of a gin-drinker always ends by producing the well-known contracted kidney, a very similar anatomical result may ensue from other pathological processes—from chronic disease of the heart, from old age, or even from primary tubal nephritis.

This view seems to be supported by the frequency with which we find "*malum coxæ senile*," or a more or less marked similar condition of another joint, in the body of an old person, without other joints being affected and without the clinical symptoms of osteo-arthritis being observed during life.

Moreover, a morbid condition of apparently the same kind is very common in the joints of horses, where it appears to be the direct result of overwork, *i. e.* of frequently repeated slight injuries, which produce a slow and gradual arthritis. We have in our Museum of Comparative Anatomy (Prep. 1637—1663) an excellent series of specimens of this kind, showing how the disease affects the vertebræ, carpus, tarsus, and other bones of the fore and hind limbs. Nor is this form of chronic osteo-arthritis confined to domestic animals. Professor

Struthers exhibited to the meeting of the British Association in 1873 several specimens of the vertebræ of whales, showing a similar anatomical condition.

Perhaps the best view to take of it is as a senile change, which comes on, to a slight extent, by mere wear and tear of the joints, and especially of the spinal column, knee, and hip, which are most exposed to the effects of mechanical pressure and shocks; which also may be produced by any chronic non-suppurative arthritis; but which only realises its full development, both in the degree of local change, in the number of joints affected, and the early age of the patient, when it is the result of the unknown conditions which we recognise clinically as chronic osteo-arthritis. We might then compare it to chronic atheromatous aortitis, which is, in many cases, a simple degeneration due to the wear and tear of life (sometimes beginning before adult age is reached, but not unfairly classed among senile changes), but which may also be produced prematurely and acutely by the action of certain causes, of which syphilis is probably one.

If any long-continued arthritis may produce more or less characteristic deformity of the joint, we ought to find this as the result of injury. I believe many surgeons will agree with me that the cases of chronic arthritis affecting a single joint, usually the knee or hip, and usually in old men, are not unfrequently the direct result of injury. Moderate synovitis with effusion followed, the joint never fully recovered, became stiff, and when examined after months or years the patella is enlarged, ridges can be felt on the femur and tibia, and there is very likely effusion in the bursa of the semimembranosus.

This question leads to another, whether there is any connection between rheumatism and "surgical" diseases of joints. I believe there is not. When injury to an exposed joint produces synovitis, which does not soon end by resolution, the structures may, as I have just stated, undergo the gradual changes of osteo-arthritis. More frequently the serous effusion remains as passive hydrops articuli. Occasionally, especially in children, the synovial membrane undergoes the pulpy change described by Sir Benjamin Brodie; and still more rarely the inflammation ends in suppuration with acute disintegration of the cartilages and destruction of the joint. The second and fourth of these events certainly follow in some cases of rheu-

matic fever, and there is some reason to believe that the first may also, though rarely, but I have never known a case in which the pulpy degeneration was the result of rheumatism. In gout there is occasional chronic synovitis, rarely some formation of exostoses, and seldom or never suppuration. The same would probably be true of "gonorrhœal rheumatism," while osteo-arthritis is not unfrequently followed by passive effusion in the joint or in adjacent bursa, and always results in the characteristic eburnation of the cartilages and excessive formation of bone.

Where inflammation of more than a single joint follows an injury, I believe we never find the clinical features of rheumatism developed, nor is the heart or pleura ever affected. In the more common cases, in which caries of the ends of the bones leads to chronic suppuration of several joints, there are also no rheumatic symptoms, and I believe that pyæmia from this cause is exceedingly rare.

The effect of local inquiry in determining an attack of gout in a person already the subject of the disease is well known. I do not think we see similar effects in the case of a patient who has already suffered from rheumatic fever, or who is the subject of gonorrhœa.

PYÆMIA.

The relation between rheumatic fever and pyæmic inflammation of the joints is very obscure. Every one is agreed as to the rarity of suppurative arthritis in rheumatism, and there was not a single instance of it among the 400 cases I have collected. On the other hand, in the only instance I remember to have seen, the disease had all the characters of ordinary rheumatism, and it would be arbitrary to consider that such cases were idiopathic pyæmia from the first. One may, perhaps, distinguish three ways in which pyæmia and rheumatism are allied. There are (1) those cases of apparently simple rheumatism which go on to suppuration of the joints, often with purulent pericarditis and pleurisy; (2) cases of pyæmia arising from ulcerative endocarditis of rheumatic origin; (3) cases of ordinary traumatic pyæmia where acute endocarditis is one of the results.¹

¹ See Dr. Fagge's paper in the 'Pathological Transactions' for 1866, p. 58.

Whether we shall ever have an embolic theory of rheumatism may be doubted; but it would, I think, be as plausible as that which assumes that the blood is poisoned by lactic acid or by anything else. Meanwhile it remains that pyæmia resembles rheumatism in producing multiple synovitis, in the attendant pyrexia, and in the frequent pericarditis and pleurisy, and occasional endocarditis, which accompany it. The differences are, of course, apparent, but they do not always prevent a difficulty in diagnosis, and I doubt if more can be said of the connection between rheumatism and gout or osteo-arthritis or gonorrhœal inflammation of the joints.

Of course, the fact that all these diseases do produce inflammation of joints proves that they really have something in common, just as there must be some condition common to enteric fever and to tuberculosis, inasmuch as they both affect the adenoid organs of the small intestine. But the objects of classifying diseases in groups are chiefly two—either we range those together which have some unmistakable common symptom in order to compare and discriminate between them, or we group those which depend on a common pathological cause, and are, therefore, amenable to the same general measures of prophylaxis and treatment. The former is an artificial classification, which expresses, perhaps, only a single true relation, but is very useful if its object is kept in view. Thus, it is convenient to study the phenomena of “fevers” together, because it is easy to ascertain the existence of pyrexia, and we can then better distinguish between the different diseases which it accompanies. Again, it is well to put side by side all the vesicular diseases of the skin, because an eruption of vesicles is a good objective symptom to start from in forming a diagnosis. But the “natural” classification is that which associates diseases whose origin, course, and relation to sex, age, and other important conditions in the patient, are in agreement. Accordingly, in a “natural” dermatological scheme symptomatic herpes of the lip, zona, and chronic eczema, would be separated as widely as possible, since they agree in nothing but in being vesicular.

In making such natural nosological groups we must not expect the accuracy of Linnæan definitions, and must be content to follow the natural method of Jussieu, by selecting certain well-marked types, and grouping the rest around them.

Among the diseases which agree in producing multiple synovitis we can, I think, distinguish five distinct types:—1. Rheumatic fever in a young adult, affecting many joints and accompanied by pericarditis. 2. Gout, with deposit of urate of soda in the metatarsal and other joints of a man who has inherited it from his father, and is also the subject of chronic renal and arterial degeneration. 3. Chronic synovitis of the knees and feet, with inflammation of the eyes, in a man who is affected with gonorrhœa. 4. Chronic arthritis, with deformity and exostoses of the hands and knees, in a woman already past middle life and otherwise in good health. 5. Suppuration of several joints, with the well-known symptoms of traumatic pyæmia. 6. Accidental inflammation of joints from extension of caries of bone, or of syphilitic periostitis.

All cases of multiple arthritis may, I think, be grouped in continuous series around these types, and though some will be so little pronounced that it is practically impossible to assign them their true position, a true diagnosis is still theoretically possible; for we cannot doubt that if we knew all the antecedent conditions, if we could see the actual condition of the joints, and could foresee the subsequent evolution of the malady, we should be able to determine to what group each case belonged. Thus the attempt at diagnosis is not an idle one, for our judgment must be either right or wrong.

And it is not a mere pathological exercise; for nothing can be of more practical importance than to be able to tell a patient whether the disease of his joints will become better or worse as he grows older, whether he is likely to transmit it to his children, whether he will ever die of it, and how he may guard against it, even if we admit that we have no infallible remedy for his complaint.

If the four types of arthritic disease which have been tabulated in this paper be admitted as four separate affections, it becomes a still more difficult task to ascertain what may be their mutual relations. I have given reasons for believing that there is no pathological connection between rheumatism, gout, and gonorrhœal synovitis. The true allies of gout are well known; those of rheumatism, which I feel disposed from my present knowledge to admit, are scarcely less so, and there is, perhaps, no more valuable discovery to be made in pathology than the real

relation between rheumatic fever and chorea. I do not see evidence of any real affinity between gonorrhœal synovitis and rheumatism, nor between either of them and osteo-arthritis.

It may be objected that the bonds of connection between these affections of the joints are more likely to be discovered by the experience of family practice than by hospital statistics; and, therefore, that the belief generally current in the profession, both in this country and abroad, may after all be right, that they may be inherited one from another, that they run in families, that they affect the same person at different periods of life, that they give rise to various mixed forms of disease, which cannot be definitely assigned to any of them, and, finally, as the result of these supposed facts, that they are only expressions of a single arthritic diathesis, or temperament, or dyscrasia, and must be treated upon that supposition.

I have given reasons for disbelieving this theory, but fully admit that it is to private rather than to hospital experience that we must look to confirm or to refute it. Only, those who have the opportunity of making such observations on a large scale must use the same precision in the use of terms and the diagnosis of cases as are necessary with the healthy criticism of a clinical ward around one. Rheumatism must mean multiple acute synovitis; gout, deposit of urate of soda; osteo-arthritis, eburnation and deformity.

I have done my best with the materials I have, and, in conclusion, have drawn up a tabular statement of some of the chief points in the natural history of rheumatism and the other diseases under discussion. It may, perhaps, be useful to students, and also serve as a summary of a good deal of the present paper.

	Rheumatism.	Gout.	Gonorrheal synovitis.	Osteo-arthritis.	Pyemia.
Relation to sex .	Indifferent	Much more common in men	Confined to men	More common in women	Indifferent.
Relation to age (first attack)	Youth, esp. 15—30	Hereditary 20—30, acquired 40—60	Dependent on its cause	From puberty onwards, esp. 30—50	Indifferent.
Relation to age (subsequent attacks)	Decreases with age	Ingravescent with age	Does not return without fresh cause	Ingravescent with age	—
Relation to family history	Hereditary	Strongly hereditary	Indifferent	Probably not hereditary	Indifferent.
Course .	Acute or subacute, relapses not uncommon	First acute, then chronic, with gradually less acute and more frequent attacks	Chronic and very obstinate	Chronic, with intercurrent acute attacks	Usually rapid, occasionally chronic.
Character of pain	Sharp, with great tenderness	Grinding, most severe	Dull, increased at night	Aching	Often but slight.
Fever .	Sthenic, sometimes high	Moderate and only symptomatic	Absent	Moderate or absent	Moderate and "typhoid" in character.
Event .	Recovery, except from hyperpyrexia	Probably never directly fatal	Recovery slow but certain	Never fatal	Almost always fatal.
Affection of the joints:					
Distribution .	Knees, hands, feet, &c.	Great toe, hand, knee, &c.	Heel, instep, sole, ankle, knee, elbow, and shoulder	Fingers, hands, knees, hip, &c.	Usually the larger joints.
Pathological condition:					
Primary .	Acute synovitis, with effusion and cedema	Synovitis, with deposit of urate of soda in cartilage, circumscribed redness and cedema	Synovitis, subacute, and then chronic	Subacute synovitis, with effusion	Suppurative synovitis.

	Rheumatism.	Gout.	Gonorrheal synovitis.	Osteo-arthritis.	Pyemia.
Pathological condition— <i>cont.</i> : Subsequent.					
Other parts affected	Occasional hydrops-articuli, still more rarely suppuration Pericardium, endocardium, pleura	Formation of tophi Ear, tendons, kidney	Fibrous ankylosis (?) Conjunctiva, sclerotic, and iris Unknown	Eburnation of cartilage, osteophytes, fibrous ankylosis None Phthisis (?)	Destruction of joint. Pericardium and pleura, endocardium, lungs, and other viscera. Traumatic erysipelas.
Pathological allies.	Chorea, erythema-nodosum, urticaria	Chronic interstitial nephritis, chronic rheumatous arteritis, psoriasis, and some forms of eczema Besides inheritance, drink, plumbism (?)	Unknown	Any preceding inflammation of the joint (?)	Suppurating wound.
Causes, predisposing	Unknown beyond previous rheumatism in patient or his parents Exposure to wet (?)	Local injury, mental excitement Excess of uric acid in blood Colchicum	Gonorrhoea (constant) Unknown	Unknown Unknown	Fœtid embolism. Unknown.
" proximal.					
" efficient.	Unknown				
Reaction to drugs.	Lemon-juice in some cases; alkalies (?)		Large doses of iodide of potassium (?)	Arsenic (?)	Quinine (?)

ON

ERYSIPELAS OF THE KIDNEY AND
URINARY TRACT,

WITH SOME REMARKS ON THE DISEASE GENERALLY CALLED
SURGICAL KIDNEY.

By JAMES F. GOODHART, M.D.

AN uncommon or new name for a disease requires a word of explanation from him who makes use of it. The cases which I propose to describe under the name of erysipelas of the kidney, &c., are selected instances of that disease which is more commonly known as surgical kidney or suppurative nephritis. I have ventured on the former term for two reasons—firstly, because I believe that some cases of suppurating kidney are really erysipelatous in their origin; and, secondly, because I want to draw very pointed attention to that fact. This I could not do so well under a more familiar term when the disease is one which everybody thinks is known so thoroughly.

The present day is one somewhat extravagant in its demand for original work. Very little originality can be elicited from these cases; they belong to a group always to be found in hospital wards, and which have been repeatedly described before, though not in the same terms. Notwithstanding this, their treatment is not yet as successful as most surgeons would wish; and I am thus emboldened to ask further attention to the subject. It has long been thought that the catheter and suppurative nephritis were closely allied as cause and effect. We have

lately been taught that the catheter is intimately connected with the appearance of living organisms in the urine, and we have also learned that "contagium is particulate." I do not now express an opinion on these doctrines, but to those who believe in them it will only be an additional link in the chain of evidence, that erysipelas, a specific something, may be communicated by the catheter.

It is to be regretted that every one who reads the cases here detailed did not see them as they occurred. They lose much of their point, when placed on paper, from the very simple fact that the weak parts in the evidence show out, as I think, unduly. They are all, perhaps, quite as well explained on a theory of mere instrumental interference, but if one waited for some direct proof of the connection between erysipelas and urinary inflammations nothing would be said at all, though if such connection does exist, it is very necessary that it should be, even frequently, strongly insisted upon. All those who have familiar remembrance of their hospital life will at once see how extremely difficult, not to say impossible, it is in any case to *prove* contagion from one patient to another, seeing that the sources are quantitatively so many and qualitatively so various. What between nurses, reporters, dressers, registrars, &c., and a miscellaneous multitude of students, some from the dissecting room, others from the dead house, others again from seeing cases at their own homes, besides the chances of exanthem poison being brought by friends who visit the inmates of a hospital, and it would be hard indeed to deny the possibility of other factors in the production of suppurating kidney than erysipelas. To *prove* the position I have taken up becomes, indeed, hopeless. The cases, however, that I have seen have left a strong conviction on my own mind, and it may not, I think, be without interest to record some of them, if haply they may be suggestive to the minds of others. They are as follows:

SERIES I.—William R—, æt. 59, was admitted to Luke Ward on July 2nd, 1873. He had had a bad foot for two years, following upon a severe contusion, and latterly it had become much worse, necessitating its rest in bed. There was great swelling of the whole of the left foot, extending for a short

distance up the leg; a small sore on the dorsal surface of the great toe, and the whole of this surface of the foot covered with a scarlet flush, extending over the ankle-joint; the superficial veins distended and the glands in the groin slightly enlarged. The next day, July 3rd, an incision was made, and a small quantity of pus evacuated. He left the hospital well on the 14th.

The surgical wards at Guy's, as will be known to many of the subscribers to these volumes, are all situated in the old building, and are so placed that two wards, having no through communication with each other, together occupy three sides of a quadrangle. The doors to these wards open upon either end of a corridor, which forms the fourth side. Thus, each is of the shape of a capital letter L, the horizontal or short arm of which abuts upon the corresponding part of an adjoining ward, being separated from it by a wall.

Consequently, each ward has a blind end. Into a bed in this part the aforesaid patient was received. In the next bed towards the end wall had been admitted some time previously a patient, 22 years of age, William R—, suffering from stricture, with a small perineal fistula, which necessitated his wearing a catheter in the bladder. He had up to this time been doing uninterruptedly well, but on July 3rd, the day after the admission of the patient whose case has just been narrated, he vomited, and had headache, furred tongue, and pains in the limbs. His temperature rose to 103.4° , and he spat a little blood. This took place without any local redness or disturbance about the perinæum. His temperature was 99.8° the next day, and he had no further inconvenience.

Two beds away from this patient and under the same dresser a patient had been admitted on June the 19th, with perineal abscess. He had a shivering fit on the 25th of June, with a temperature of 104.2 , and a pulse of 110. This was evidently consequent on pus forming in the perineum, and subsided on its evacuation the same day. A catheter was passed and tied in.

On July 4th (the next day but one to the admission of the case of erysipelas, and nine days after his previous attack) he had again excessive shivering, with pains in his knee- and hip-joints. His tongue was furred. Temperature of 102.1° , with some pallor of countenance. The temperature fell the next day

to 100·8°, and he was better. In addition to his other symptoms the urine, which on his admission only gave a trace of albumen, became purulent, with a good deal of albumen, more so, it was thought, than the mere presence of pus would account for. Two or three days after, he had an erysipelatous blush about his nose. He left the hospital very little improved, and in an extremely anæmic condition.

Both these cases are capable of an interpretation other than that I wish to put upon them. They are brought forward to illustrate the extreme liability of absorption of erysipelas poison by the urinary passages. But it may be said that they are only instances, common enough in surgical wards, of erysipelas attacking any who have at the time of its outbreak any breach of surface. Both these cases had perineal fistulæ. Still, it is curious that in the whole ward of over twenty patients, many of whom had wounds of one sort or another, two cases of stricture only should have fertilised the poison, and that in so remarkably speedy a manner.

SERIES II.—On June 12th, 1873, a patient, Isaac L—, æt. 44, was admitted into Lazarus with stricture of the urethra. He stated that he had had difficulty in passing his urine for six years, and that he had at present received no treatment. He was healthy looking, and only complained of the local trouble. An attempt at catheterism was made, but failed, and he was then ordered alkaline treatment, with belladonna and hot baths.

On the 14th it is noted that an attempt at catheterism was made, and again failed. He passed his urine in a small stream, but better than he had done since admission. His appetite was good, and he slept well. The urine was clear.

16th.—The urine is still normal.

18th.—He now has puffiness of the right eye. He has slept badly, and has great scalding on micturition. He has a pulse of 112; a temp. of 103·1°. The urine passed in twenty-four hours, 36 oz., acid, sp. gr. 1018; urea about 433 grains, or 12 grains per oz.

19th.—Temp. 103·5°; pulse 112. He has an eruption in both groins. Urine 40 oz., neutral, sp. gr. 1018; urea 482 grains. Ordered wine 3jv.

20th.—Temp. 102·1°; pulse 100. Rash fading. Pain all

over his body. The urine contains much thick tenacious mucus, 40 oz., alkaline and ammoniacal, sp. gr. 1020.

21st.—Temp. 103·8°; pulse 112. Brown dry tongue. The urine contains pus to-day. Quantity passed in twenty-four hours 46. oz, sp. gr. 1024; it is alkaline and ammoniacal, containing two thirds of ropy mucus and pus.

22nd.—Urine passed, 63 oz. in twenty-four hours.

23rd.—Urine passed, 62 oz. Temp. 102°; pulse 132. The urine contains less mucus in it.

24th.—To-day he has double pleurisy; tongue dry; pulse 120; temp. fallen to 101°; resp. 40; urine 60 oz.

Much muscular tremor; he died at 12.30 midnight. The urine for the twelve hours before death measured 30 oz., sp. gr. 1020, one fourth pus, alkaline and ammoniacal, containing 328 grains of urea.

The inspection made by Dr. Fagge showed double pleurisy, scattered pyæmic patches in both lungs, and pericarditis dependent upon an abscess beneath the pericardium, in the wall of the ventricle.

The kidneys contained numerous scattered points of suppuration in each cortex, and in one was a large irregular mass. The pelvis was pale, and quite free from inflammatory action, the pyramids quite normal in appearance. The only exception to this was in the case of that belonging to the largest patch of inflammation in the cortex. This was inflamed and discoloured. The bladder was inflamed, thickened, and contained purulent mucus. There were numerous scattered points of suppuration in the corpus spongiosum, prostate, and left vesicula seminalis. The prostatic veins appeared to be unaffected.

On the day that the foregoing patient was admitted, and under the same dresser, though in a different ward, a child, aged 2, was admitted with diffuse cellular inflammation of the right thigh, apparently dependent upon acute osteitis. A large abscess had formed, and she was extremely ill. She died on the 19th of pyæmia, having the distribution peculiar to these bone cases of secondary abscesses in the heart and kidneys. It seems possible that this case had something to do with the adverse termination of the other.

SERIES III.—Two cases of stricture were admitted into Lazarus

Ward, one on January 24th, the other on January 27th, of the present year. They were both taken into the back ward, the one being in No. 11 bed, the other in No. 15. They were both under the care of the same dresser. They were both old cases, the one being twenty-five years in its history, the other two. They had both been subject to catheterism before admission, the oldest one repeatedly, though not immediately before. On admission the one could only pass his urine in drops, the urine being thick, and no catheter could be passed. The other passed urine after a bath, which had some mucus in it, but was not offensive. Both cases were kept in bed, and occasional attempts at catheterism tried, and till February 11th they may be said to have been waiting out their period of rest prior to the dilatation of the stricture. On February 11th the one had rigors, nausea, pain in perinæum, and ill-defined thickening, with a temperature of 104.7° , pulse 96, and dry tongue. The other on the same day had also headache, anorexia, purging, and pain about the bladder and urethra; the temperature is not stated on this day, but on the next, February 12th, it was 102° , and the next 104.4° . Both cases terminated in due course in a perineal fistula.

On looking about for possible cause of infection in these two instances, it cannot be said that the search was altogether satisfactory. A patient had been admitted into another ward on January 22nd with a large mammary abscess, occurring during lactation after confinement. She had had many children previously, and was a very unhealthy looking woman, with an average pulse of 120 and a temp. of 100.4° . Eighteen ounces of pus were evacuated by an incision, and again, on the 24th, a fresh incision was made, and a little more pus withdrawn.

She went on well, improving slowly, but on February 13th, two days *after* the appearance of pyrexial symptoms in the two men, it is noted that for the last two days there has been an increase of discharge. The temperature has also increased, and is now 100.4° .

I am not inclined to lay any stress upon this case as it stands as a cause of the other two; indeed, inasmuch as the crisis of the attack was not apparently reached till after that of the others, it would rather appear to have followed than to have preceded the fever occurrent to the case of stricture. I have, however, inserted

it, because, whether a cause itself or not, occurring at the same time as did the other cases, and under the manipulative care of the same dresser, it lends additional support to the infection hypothesis. It matters not if all these were produced by some common and now untraceable source. If they had one in common, they are of interest, because they may be prevented by attacking the one primary source of mischief.

But it is quite possible that this woman may have been really the infecting source: we know nothing of the infective nature of the pus from one patient upon the secretions, mucous surfaces, or blood of another; we know, I venture to think, nothing of the various decompositions which pus undergoes before it is discharged from any given surface such as this abscess cavity in the breast. It is even possible, I suppose, for erysipelas poison to be *cultivated* in such a bed as this without influencing, to any great extent, the soil in which it is nurtured, while for other people it may be a poison of the greatest activity. However this may be, these three cases stand together nearly related in the time of their occurrence, and I could find no other source of infection.

SERIES IV.—These cases are all more or less linked together, while, again, the origin of the mischief is somewhat difficult to discover.

Between May 11th and June 14th three patients died from stricture and suppurating kidney, all in the same ward and all under the care of the same dresser; while two other cases of bladder trouble in the same ward about the same time—one under the same dresser, the other under the care of another gentleman—had each an anomalous attack, which looked like blood-poisoning rather than anything else. It may be said of them, however, that at no time were their lives in danger. The facts are shortly these:

George S—, æt. 48, was admitted on March 14th. He had never had gonorrhœa, but had several times had swelling of the testicle. Four years ago he first had retention of urine. He had not noticed anything wrong before. His urine was first seen to be thick three weeks ago, and remained so for a fortnight. He had a catheter passed at this time.

When admitted he could pass a small stream of urine, and he was in good general health. It does not appear from the report that the urine became thick till some time subsequently.

Repeated attempts were made at catheterism, but unsuccessfully, and on the 27th of March he had rigors. These were repeated on the 29th and 30th, but were not followed by anything more serious than an inflamed testicle.

On April 12th he had severe headache; his temperature was 102.4° , pulse 98, and his urine thick. He subsequently got extravasation of urine; incisions were made into the scrotum and perinæum, and he finally died of pyæmia on May 12th.

At the post-mortem pyæmic abscesses occupied the lungs; the kidneys were very large, weighing thirty-two ounces, and were full of small cysts. The bladder was much hypertrophied, and the walls half an inch thick; the urethra was very tightly strictured and dilated behind the constriction. He had one false passage, but no sloughing existed.

Now, where this man got his pyæmia I do not know; but this is clear, that whereas he was in good health on his admission to the hospital, the passage of catheters sufficed to excite a high degree of fever long before any extravasation took place or before any wound was made that could account for the blood-poisoning, and this, probably, without any suppuration of the kidney. It seems clear, to my mind, that the mere passage of catheters was enough to set up this, and put him in a fair way for getting pyæmia.

At the same time a patient, Richard C—, occupied a bed nearly opposite to him with calculus in the bladder. On May 11th (the day before the former patient died) he began to complain of rheumatic pains in the right side and front of the chest, and on the 13th he had a distinct tender swelling over the second rib; he also stated that his urine had been thicker since the passage of a lithotrite on the 7th.

On the 17th he became quite unable to move his right arm; the swelling subsided, but an erythematous redness diffused itself over the right side of the chest. His urine became rather clearer, but he got some slight swelling and pain in front of the anterior fold of the right axilla. His temperature oscillated between 98° and 99° , and was now 100° . A circular patch

now appeared on the left shin, the size of a half-crown piece, reddened by a general flush and ecchymotic points. It was very tender, accompanied with a little subcutaneous thickening.

He left the hospital on May 28th. The patch of erythema on the shin was spreading, and the swelling over the rib now fluctuating. Temp. 100°.

On May 16th a patient, æt. 51, was admitted to a bed, one other only intervening between him and the last-named patient. He gave a history of urinary trouble for seven years, and occasionally during that time he had passed a catheter himself, his stream being generally of good size. Attempts at catheterism had been made for him as an out-patient, but without success.

When admitted he had some scalding on micturition; his urine contained pus and phosphates, and no catheter could be passed.

The next two days he had rigors. Temp. 102°; pulse 120; resp. 36; urine thick and ropy; no perineal thickening; profuse sweating followed. He was ordered Mist. Quinæ ʒj t. d., and his temperature fell next day to 96·8°. He seemed altogether better.

On May 22nd he again had sweating; his temperature was 101°; urine ammoniacal and thick. He now had perineal tenderness and swelling, then extensive extravasation, to relieve which perineal section was resorted to, and he died of pyæmia on June 13th. Up to the day before his death his temperature was between 102·5° and 103°.

The post-mortem, made by Dr. Fagge, showed several small pyæmic abscesses in the lungs. The kidneys weighed ten ounces; both of them presented numerous points of suppuration, and one seemed to have hardly any part of its cortex left uninflamed. The pelvis was but little altered, presenting only a slight increase of vascularity and some points of ecchymosis.

The bladder was inflamed and contracted. The prostate had many points of suppuration in it, and in its left side an abscess of considerable size, which ran backwards below the bladder; there were many points of suppuration also in the connective tissue about the prostate, and pus was seen to come from the

mouths of divided veins. The connective tissue of the perinæum was in a sloughy state.

On May 15th a patient, Henry H—, æt. 55, was admitted into Lazarus, bed No. 16. He had been treated for stricture ten years ago in the hospital, and had left, as he said, cured. He had not found any necessity to pass catheters since. In the last eighteen months he has had several attacks of partial retention, the urine being very thick, and only coming in drops. A fortnight previously he had had one of these attacks, and unsuccessful attempts at catheterism had been made. The want of success appears chiefly to have depended upon a perineal abscess which was forming at that time, and which was opened twelve days before his admission, but which has since closed. When admitted he had some thickening in the perinæum, but no wound. He passed urine in a small stream; it was thick and contained pus. A fresh perineal abscess formed soon after admission, but within four days of his entry flexible catheters Nos. 6 and 7 could be passed, and the stricture caused no further trouble. He had also a large prostate, and once had retention, probably owing to this. He had, however, much cystitis, as was evident from the state of his urine, and to relieve this his bladder was washed out daily with a weak solution of carbolic acid. He was thought to be doing well, his temperature varying between 98° and 99°, and his pulse being about 80.

On June 11th, two days, it will be noticed, previous to the death of the prementioned patient from pyæmia, his pulse went up to 108, and his temp. to 104·8°. He got a dry tongue, rheumatic pains, and died on the 13th.

At the post-mortem examination the kidneys weighed eleven ounces. Some spots of recent suppuration were found in the cortical structure, and one abscess much larger than the rest, the adjacent cortex being indurated, as if it had been the seat of a past inflammation. The pelves were greatly dilated. Bladder thickened, of moderate size, its lining membrane much inflamed.

Such a case as this seems to me an important one. Here was a patient admitted with a severe form of cystitis. There was evidence that on and off for the last eighteen months he had been in a similar state; it is even highly probable, seeing what a great deviation from the normal standard of health, the

class of patients frequenting hospitals are in the habit of calling "nothing," that more or less cystitis had existed all the time. He was submitted during his stay to most careful treatment, and I can state from personal knowledge that his bladder was washed out daily by a most attentive and able dresser, and he improves under the treatment, and then, when pyæmia is in the ward, he suddenly dies with high fever and general blood-poisoning.

Now, how he was to fall into a pyæmic state, except by means of his genito-urinary mucous tract, it is not easy to see. It is also not easy to see why, with a suppurative disease of bladder going on for some time previously, he should have changed for the worse at this particular time, unless it was owing to some special external conditions which acted upon the bladder or urine, by means of the daily catheter.

Another patient at this particular time, though doing, on the whole, uninterruptedly well, on May 29th had rigors, sweating, and a temp. of 100.4° , with headache, giddiness, and loss of appetite. The attack in his case only lasted a day or two, and hardly could be said to retard the progress of the case; but it seems, slight as it is, to be most significant, occurring at this particular time.

SERIES V.—John W—, æt. 45, a seaman, a remarkably healthy looking though fat man, was admitted during the course of the present year for stricture of the urethra and retention. No catheter could be passed, and puncture per rectum was had recourse to. He did very well until three days after, when he had rigors. However, on the fourth day he was still pretty well, sitting up in bed, reading a newspaper, and the canula was taken away from the bowel. He now got pains about his sterno-clavicular region and left forearm, fell into a typhoid state, and died four days after. He became very yellow before death, and had evidently got a severe form of pyæmia.

At the post-mortem, abscesses were found on the left side of the chest, in the cellular tissue just below the clavicle and sterno-clavicular articulation, in the muscular tissue over the lower ribs on the right side, and in the intermuscular septa deep among the muscles of the forearm. In addition, the muscular wall of

the heart had three almost diffuent patches, which could not correctly be called abscesses, seeing that the pus they contained was in very small amount; they were, in truth, sloughing muscle, and when examined by the microscope, fifty hours after death, they were swarming with bacteria;—indeed, but little else could be seen. But few pus-cells existed. The healthy muscle elsewhere in the heart away from the diseased patches was examined carefully at the same time; it also was not free from bacteria, but while in the healthy parts they had to be counted by units with long distances between, in the sloughing parts they were aggregated in masses uncountable.

The lungs had some hypostatic pneumonia at their bases. The bladder and kidneys were practically healthy, the kidneys quite so, the bladder containing neither alkaline nor offensive pus. The channel made by the canula from the rectum to the bladder looked a little sloughy, but the prostate in its neighbourhood was perfectly healthy, and no pus could be found in any of the veins. The chief mischief seemed to be in front of the stricture, which occupied the usual spot near the end of the corpus spongiosum. In the bulb was found a sloughing cavity, half an inch in diameter, containing a thin dirty brown fluid, and communicating with the urethra by a channel which joined it near the end of the corpus spongiosum. No suppuration could be found in any of the veins about the part.

To complete the history of this case, it must be stated that on the same day on which this man had his first rigors another patient in the same ward had an operation performed on his face, and within two days he got a sharp attack of erysipelas, the temperature rising to $102\cdot4^{\circ}$, then to $105\cdot6^{\circ}$, and he was not well at the end of a fortnight.

Taking these facts together, it seems that the conclusion is well warranted that the ward at this particular time was erysipelatous, and I think there can be no doubt whatever, that the man who had stricture lost his life by the unfortunate though absolutely necessary catheterism at this particular time.

Here we must take leave of this special part of our subject to say a few words on the disease in general; and inasmuch as what I have to say will, in great measure, be based upon material obtained from the post-mortem records of Guy's Hospital

for nineteen years past, I propose first to deal shortly with the statistics of the subject, and subsequently with the questions of diagnosis, prognosis, and treatment.

The main facts elicited from the perusal of the post-mortem records are these :

In nineteen years the number of patients dying from local disease or causes secondary to it, with evidence of old urinary obstruction, amounts to 277—a yearly average this of about 14·6 cases.

They are thus apportioned to the different diseases :

	Cases.
Stricture	100
Enlarged prostate	27
Calculus vesicæ	44
Cancer of bladder	14
„ uterus and bladder	29
Pressure from external tumours, &c.	7
Paraplegia from disease or fracture	56
Total	277

I. Among the cases of stricture, 100 deaths occurred in nineteen years, giving a yearly average of about 5·26. This closely accords with the numbers given by Dr. Steele in a former volume of the 'Guy's Hospital Reports,' where for the period 1861 to 1868 the number of annual admissions averaged 105, with an annual average mortality of six.

Of the whole number of cases, the kidneys were suppurating in forty-one of the 100; they were wasted or inflamed in eighteen; in seven they showed evidence of the changes included under the term Bright's disease, or were cystic; while in the remaining thirty-four they were healthy.

Thus, fifty-nine, or nearly three fifths of all the cases, had advanced disease of the kidney.

In twenty-four of the fifty-nine one kidney was much more affected than the other, and in three of those in which suppuration occurred it was confined to one side, in one case disease being limited to one side, in the other two the non-suppurating organ was wasted.

The state of the bladder is not stated in thirteen cases. It was found healthy in five, and in three of these the kidneys were also healthy; the other two were cases, the one of suppuration, the other of atrophy of the kidney.

The remainder, eighty-two in number, are all noted as having an hypertrophied muscular coat, this condition going with a contracted state of the cavity in twelve, with dilatation in two only. It is, however, I think, probable that the size of the cavity has, in many cases, escaped notice, and only the very marked conditions have been recorded as of any moment.

Of those cases of hypertrophy associated with contracted bladder the kidneys were—

Cystic in 1 case.	Suppurating in 6 cases.
Wasted „ 3 cases.	Healthy „ 2 „

The suppurating organ on the one side was twice associated with a wasting condition on the other. The two cases of hypertrophy with dilatation both occurred with suppurating kidneys.

Mucous coat.—In 12 sacculation existed, in 9 the membrane was inflamed, in 20 various degrees of more intense cystitis were noted. Only 23 of the number have the condition of the urine stated; fetid and purulent was the description of most of them. It is only directly stated to have been ammoniacal in four.

Ureter.—Dilatation is recorded against 20 cases, thickening in 4 cases, inflammation and suppuration in 12 cases.

Respecting the relation existing between acute and chronic disease of the kidney I am a little doubtful whether it is quite correct to assume that, a stricture having existed for a long time, the kidney will probably show evidence of old disease. The pelvis of the kidney will likely enough be found dilated and the pyramids flattened down, and, perhaps, the capsule thick, but the facts do not allow me to say that, in the majority, the cortical substance is deteriorated. The cases of stricture dying out of the usual course by extravasation of urine or by some other disease show for the most part either an acute disease or a healthy state, and not evidence of chronic mischief oftener than in the proportion of one in five, with the exception of pelvic dilatation, as before said. It is most likely that the wasted cortex found in many old cases is dependent, not on atrophy by mere pressure backwards of the urine, but on inflammation of the renal pelvis, *associated* with cortical atrophy, and this would seem to confirm what is said in another part on the question of atrophy and pressure. The block produced by pyelitis and inflammation amid the straight tubes would be much more complete

than in obstruction further forwards. The available space for storing the secretion would be much less; the tension, therefore, greater, and the greater the probability of the secretion force being neutralized thereby.

It has further been shown by Mr. Bryant ('Medico-Chir. Trans.,' vol. xlv, p. 337), in an analysis of 280 cases of lithotomy, that the longer a stone exists in a patient's bladder the more the probability of the kidneys being diseased. In 17 of 19 deaths kidney disease existed in different degrees of severity, suppuration and degeneration being present in all. In the list of cases I have collected, 39, omitting one case of granular kidney, out of 44 cases, had disease of the kidney; this is a much larger proportion than in stricture cases, where 59 of 100 only are so diseased. This is what one would expect if it be true, as I have said, that mere backward pressure is often not sufficient, without inflammation super-added, to damage the kidneys materially. Stone cases being liable to repeated attacks of cystitis, should show a large proportion of cases of diseased kidney, and that in such cases they are indeed exceedingly liable to inflammatory changes will be seen at once on referring to the cases given by Mr. Bryant and those tabulated here.

Again, it must not too hastily be concluded that chronic changes in the kidney are elements predisposing to a suppurative state. Other things being equal, a diseased part is more liable to become inflamed than a healthy one, and there is no reason that I know why the kidney should prove any exception to the general rule; but I take it that in cases of bygone pelvic inflammation the vessels of the diseased parts have undergone thickening and narrowing and retraction. The cortical atrophy is itself the best evidence of this, and the parts are altogether less vascular. The actual number of cases where, with old disease in the shape of irregular surface, an acute inflammation or suppuration occurred, amounted to no more than ten, or in all the cases of diseased kidney, in the proportion of about 1 in 6. The condition of the heart was noted in 17 cases. In three there was some slight hypertrophy, but in no case was it extreme. Lastly, as to the cause of death. In those patients, not dying directly from suppurating kidneys, extravasation and its consequences take a large share in the fatal result, perineal

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section and pyæmia coming next. Another cause is suppuration about the bladder and prostate, while some ten or eleven died of disease altogether unconnected with their stricture, and which need not be enumerated here.

II. The cases of enlarged prostate are 27 in number:

	Cases.
Kidneys, suppurating	20
" wasted	2
" granular	2
" inflamed	1
" dilated pelvis	1
" healthy	1

There is a considerable difference, then, between them and the cases of stricture. Three fifths only of the stricture cases died with kidney disease; here 1 in 1·17 dies—23 out of a total of 27. In 7 of the 23 the two organs were attacked to an unequal extent, and in 1 the suppuration was unilateral. In 2 an acute suppurative disease was combined with a chronic wasting one.

The changes in the bladder do not differ materially in character from those found in stricture. The proportion of cases in which it was dilated is larger, but the numbers are not large enough to warrant any definite conclusions.

The *muscular coat* was hypertrophied in 20 cases, hypertrophied and contracted in 1, hypertrophied and dilated in 5.

The *mucous coat* was sacculated in 4, inflamed in 12. In the only case in which the kidney was healthy the bladder was hypertrophied, sacculated, and sloughing.

The *ureters* are not mentioned in 13 cases. For the rest they are dilated in 6, inflamed in 4, thickened in 7.

The urine, in all the cases in which its condition is stated, 12 in number, was either purulent, fetid, or ammoniacal.

The coexistence of acute and chronic disease is only found in 2 cases.

The condition of the heart is mentioned in 8 cases; 1 weighed sixteen ounces, 1 thirteen ounces, 3 twelve ounces, and three are described as normal.

III. Cancer of bladder, 14 cases :

	Cases.
Kidneys, suppurating	6
„ wasted	5
„ dilated pelvis	2
„ healthy	1

In 6, one side was more affected than the other, suppuration occurring twice in one organ only; wasting also in 2 was confined to one side. In 1 of these the growth distinctly involved that side of the bladder. The existence of acute with chronic disease is not found in this series.

The bladder is said to have been hypertrophied in 4, sloughing in 1, healthy in 1. In the remainder the new growth appears to have monopolised attention, and the existence of suppuration is not stated. The urine was purulent or thick in 3 cases.

The ureters were dilated in 7 cases. The other 7 were not described.

IV. Vesical calculus, 44 cases. This gives a yearly average mortality of 2·31, or, taking the average number of admissions as 30 cases per annum—that given by Dr. Steele in his tables—a mortality of about 7 per cent.

	Cases.
Kidneys, suppurating	31
„ inflamed or wasted	8
„ granular	1
„ healthy	4

Nineteen of the 39 subjects had disease of different intensity on the two sides, and in 8 of these the suppuration was confined to one kidney entirely, being associated in 3 cases with a healthy state on the opposite side, in the others with a wasted organ. It is to be noted, in all these cases, that the wasted side is not the suppurating one. The abscesses are found in a comparatively healthy kidney.

In 5, acute and chronic disease were blended.

Bladder, muscular coat.—Hypertrophy is only described as existing in 8; the cavity was contracted in 13; dilatation is not mentioned once; sacculation was present in only two.

Mucous coat.—Inflammation, in one of its various degrees, was present in 23 cases, going to the extent of suppuration, sloughing, or the formation of lymph and phosphatic matter in

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14. In the other 9 it is said to have been inflamed, injected, or ecchymosed. Six only are described as healthy, the kidneys in the corresponding cases suppurating in 4, inflamed in 1, healthy in only 1.

The ureters were dilated in 13, inflamed in 16, having gone the length of suppuration or being lined with fetid lymph in 7 of the 16. In 1 case dilatation and injection were confined to one side, in another the right side was dilated, the left injected.

The condition of the heart is stated in 4 cases, and all may be said to have been healthy, the greatest weight being twelve ounces.

The urine is mentioned in 11 cases, and in all was offensive, ammoniacal, or purulent.

Lithotomy was performed in 22 cases.

Lithotrity " " 8 "

Perineal section " " 2 "

Lithotrity and lithotomy " 1 case.

None . . . 10 cases.

Of the cases in which a healthy state of the kidney was found, one had suffered lithotomy, one lithotrity; in 2 no operation had been attempted.

Of those in which a healthy bladder obtained—

Lithotomy had been performed in 2 cases.

Lithotrity " " 2 "

Both " " 1 case.

None . . . 2 cases.

The points to be noted especially in this group are, I think, first, the large proportion of cases of acute suppuration and inflammation, of the former in the proportion of 1 to 1·42; of all acute disease together 1 to 1·21, this going with a greater extent of surgical interference, 33 cases out of 44 undergoing serious operations about the bladder. In stricture cases the proportion of cases of acute disease is only in the proportion of 1 to 2·38. In large prostate cases it is about the same as for calculus, 1 to 1·28 of all cases.

Secondly, it is important to note the condition of the bladder as to the size of the cavity, which in 13 was contracted, or in nearly half the total number. The bearings of this point will be indicated presently.

V. Cancer of uterus, 29 cases :

Kidneys, suppurating	Cases. 6
" inflamed	1
" dilated	11
" wasted	11
	<hr/> 29

Fifteen of these were affected on one side more than on the other. In 10 of them the disease was entirely confined to one kidney.

	Cases.	
Ureters, dilated in	14.	On one side only, in two cases.
" inflamed in	3.	Associated with suppuration of the kidney, twice; with an atrophic state, once.
" thickened in	1.	
" not stated in	11.	

Bladder, inflamed	Cases. 4
" healthy	14
" laid open by disease	10
" not stated	1
	<hr/> 29

Of the 10 cases of one-sided disease of the kidney, 5 were directly attributable to a local implication of one ureter,—either by a nodule of cancer at its orifice in the bladder, or as it ran in the neighbourhood of the diseased uterus on its way to the bladder,—and all were cases of shrinking.

Of the 10 cases in which the bladder was laid open by the disease, suppuration of the kidney occurred three times; two of the three, however, were associated with a retained urinary secretion, owing to the position of the outlet; in one of them the urine was ammoniacal. Acute inflammation occurred in one case. In two of the remainder an inflamed bladder was found, the kidneys being unaffected, except by the presence of the new growth.

Three other cases of suppuration complete the total for cancer of uterus, and they are of sufficient interest, from the obscurity of their cause, to justify a short note of each being inserted.

Jane C—, æt. 44, was admitted under Dr. Rees on March 8th,

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1865, with cancer of the uterus. She died on May 12th. She was almost dying on admission, her principal symptom being constant sickness. It was thought she must have carcinoma of the stomach. There appears to have been no suspicion of urinary trouble.

At the inspection, one kidney was distended, and its pelvis filled with pus, the mucous membrane and ureter being inflamed. The condition appeared to be due to an implication of the right ureter in disease of the lymphatic glands in the iliac region. She had carcinoma of the cervix uteri.

Elizabeth W—, æt. 65, was admitted in 1866, without any history, and she died suddenly. The kidneys were pale and anæmic. Dr. Moxon reports upon them microscopically, that they contained shrivelled Malpighian tufts, small microcysts, and free fat-grains, in an open-textured stroma. They had interstitial suppurating spots.

The bladder was enormously distended with *clear, pale* urine ; its coats not inflamed, its muscle-fibre hypertrophied. The bladder was cancerous at its neck, but its cavity was not laid open.

Sarah M—, age not stated ; was admitted November 16th, 1869. No history. She had cancer of the uterus.

The kidneys weighed eleven ounces ; were both pale ; the left had suppurative pyelitis, and was in a very foul state. Corresponding to this condition, it was found that the bladder within showed much inflammation around the orifice of the left ureter, and none around the right. The injected mucous membrane had on it a coat of lymph. The right kidney was healthy.

In none of these three does it appear that catheterism had anything to do with the suppurative nephritis. It is not likely in any that it was due to a general pyæmic poisoning, since only one kidney was attacked in each case, and we are forced to the conclusion that local conditions were the sufficient cause.

In the second of the cases the facts are very explicit. The bladder was not inflamed, and its contents consisted of clear, pale urine. Could such a fluid have been undergoing putrefactive decomposition, or have been sufficiently altered to excite suppuration in the kidney, without showing some amount of

change in the other parts also? At the same time it is by no means easy, in objecting to the common explanation in such a case, to find a better. I fancy, however, that mere "over-action" is the direction in which it must lie—in that want of balance, which is elsewhere discussed, between secretion and a neutralizing pressure produced by the reflux of urine. The kidney, it may be suggested, is stimulated to greater work by the contiguity of products which, although already excreted by it, are still close enough to the gland-cells to influence their action, perhaps, indeed, by returning to them again by reabsorption to be re-excreted in consequence of the obstruction in front. One of the most extreme forms of suppurating kidney that one could ever see, is to be found in the Hunterian Museum at the Royal College of Surgeons (prep. 1893), and it has this history attached:—"From a man sixty years old, to whom tincture of cantharides had been given for incontinence which followed retention. The medicine produced extreme pain, both in the bladder and kidneys, and retention of urine, which continued two days. When the urine was drawn off it was fetid and mixed with blood and pus. All power over the bladder was lost, and the patient died in three weeks."

The kidney is well described as one in which "pus was extensively diffused through the cortical substance and between it and the capsule. The capsule has been removed, and the surface of the kidney is flocculent and covered with numerous shreds of its softened and broken-down tissue." It is this flocculent state which gives it the appearance of such extreme disease, and there can hardly be a space of a line or two throughout the organ which is not the seat of minute abscesses. This case seems to me an illustration of the explanation given to the case preceding it. The man died, indeed, it is said, with a sloughing bladder and large prostate as well, and it is not stated in so many words that he had had no catheter passed before the cantharides was administered; but allowing these deficiencies to be somewhat detrimental to the case for my purpose, it still remains that the condition of the kidney is an exceedingly bad one, worse than any other I have myself seen, and I cannot but think that the drug given for his relief had much to do with it in the direction of over-stimulation.

Eight additional cases occur where displacement of the

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uterus, pelvic tumours, &c., were present, and had caused, in seven cases, changes in the urinary organs, suppuration in three cases being unilateral; wasting in four, two of them unilateral. In one of vesico-vaginal fistula the kidney is not mentioned; we may therefore presume that it was normal. The bladder was healthy.

The ureters were dilated in two cases, both of pelvic tumour, one a solid uterine growth, the other an ovarian tumour. They were inflamed in another case, one of prolapsus uteri, in association with a suppurating kidney, sloughing bladder, and fetid urine. A second case of prolapsus uteri had wasted kidneys, thick ureters, and hypertrophied bladder with muco-purulent contents.

VI. The last group to be mentioned is that of paraplegia, whether due to fracture and injury of the cord or to the primary disease of the medulla spinalis itself. One case of retention during an attack of cholera is also placed with them. It fitly goes with the others as an instance of paralysis of the bladder.

The total number of cases is 56. This comprises—

	Cases.
Suppurating kidney	26
Inflamed "	3
Wasted "	1
Healthy "	24
Not stated	2
	<hr/> 56

Twenty-nine cases, then, out of 56, or rather more than half died with acute disease of the kidney.

In only five of the 30 cases of disease was one kidney affected more than the other, showing thus a great difference between this group and that of stricture of the urethra, where 24 out of 59 cases showed mischief to excess on one side

The acute disease of the kidney was associated with

Sloughing bladder in 7 cases.
Inflamed " 16 "

Dilatation of its cavity was associated with one or other of these conditions in 3 cases, contraction in 2, hypertrophy in three; and here again may be remarked, as contrasting cases of obstructed outflow with cases of loss of expulsive power,

that the latter are marked by an absence of the hypertrophied state of the bladder noticed in the former.

The 24 cases in which the kidneys were found healthy were associated with—

Contracted bladder in 2 cases.				
Inflamed	"	8	"	
Healthy	"	4	"	
Not stated	.	11	"	One case being included both as inflamed and contracted.

The ureters were inflamed in 14 cases.

The urine was fetid and purulent in 8 cases, ammoniacal in 1, in the others its condition is not stated.

Catheterism is noted as having been resorted to in 13.

The length of time between admission and death varied exceedingly. The shortest case was three days in the hospital only, the bladder being inflamed, suppurating, and with highly offensive urine at the end of that time. The shortest period at which a suppurating kidney was found was six days.

The patient living longest died at the end of twelve months, and the kidneys were found to be healthy.

So much for the statistics which the post-mortem records have afforded. Looking back now upon the whole number of cases, we have the following results in respect of the kidney :

Nature of case.	Deaths from all causes.	Kidney, suppurating.	Kidney, wasted or inflamed.	Dilated pelvis, &c.	Kidney, healthy.
Stricture	100	41	18	3	34
Enlarged prostate . . .	27	20	3	7	1
Calculus vesicæ	44	31	8	1	4
Cancer of bladder . . .	14	6	5	2	1
" uterus, &c.	29	6	12	11	...
Displacement, tumour, &c., of uterus	7	3	4	...	1
Paraplegia	56	26	4	...	24
	277	133	54	24	65

Thus, nearly half the deaths from interference with the free play of the stream of urine, or the channels along which that stream passes, are attended with suppurative nephritis, while they are in the proportion of 1 to 1·48 taking suppuration, the less intense form of inflammation, and wasting together.

Of all the questions connected with the subject, perhaps the cause of the suppuration is still the most interesting, if only from the exceeding practical importance of such a large class of cases. The consideration of this, the main question, involves the recognition of certain minor ones, the bearing of which on the production of the suppuration is still under discussion. The points which chiefly commend themselves to our notice are these: the possibility or not of the disease being lighted up idiopathically; whether the necessity of contamination by atmospheric influence is invariable or not; or, again, the relation in which the surgeon stands to its production. All these questions really admit of the least delay possible in their settlement, for upon their issue depends the preventive treatment of each case. But some will perhaps ask what more can be said on the subject of surgical kidney than is already known? To say that it is a disease especially attendant upon operations about the bladder defines its cause: what else is there to know? A few words on the following points will go far towards answering this question by indicating the direction in which its solution may be found.

1. Is the disease invariably secondary to inflammation of the bladder?

2. In secondary inflammation of the kidney what evidence is there, if any, that cystitis *per se*, uncomplicated by surgical interference or atmospheric influences, is the efficient cause?

3. What evidence is there that inflammatory products of special nature are requisite to originate the disease, *i.e.* in how far does the surgeon by mere cutting or operations intensify ordinary inflammatory products into something specially liable to cause the formation of pus? In how far is the mere contact of air sufficient to provoke suppuration? How far are zymotic poisons influential to the obtaining conditions?

Firstly, that the disease is almost invariably secondary to inflammation of the bladder, may be considered, at any rate, definitely settled. I can do no better on this point than quote Dr. Wilks, who says in his 'Pathological Anatomy,' p. 358, "This is a secondary affection; it results from inflammation of the bladder." Rayer also, as early as 1839, seemed to have formed the same opinion. Rindfleisch describes the renal disease as an inflammation propagated from the greater urinary passages; while Dickinson writes, "Inflammation of the bladder, or of the

pelvis of the kidney, either as antecedent to the change (suppuration of the kidney) or associated with it, is so invariably present as to give a seeming warrant to the old view of extension by contiguity of inflammation. "It is not, however," he says, "a mere creeping of inflammation, but an absorption of morbid matter." On such authorities, then, this point may be regarded as settled. There can indeed be no question whatever that a very large proportion of cases are associated with an inflamed bladder; and of their being secondary in point of time, no one familiar with hospital cases will require proof. A patient is admitted with old cystitis and stricture; he is treated and does well for a time, and then has rigors, &c., and rather suddenly dies, minute suppurations in the kidney being found post-mortem, which cannot have been in existence long. Such a history is common, and by the repetition proves the position maintained. Of the foregoing cases, however, I find nine in which the bladder is stated to be healthy; of three of these, short notes have already been given. In addition to these nine, six other cases will be noted directly which also bear in the same direction, so that too exclusive a rule must not be laid down on this point. It is true that the affections classed as Bright's disease do not terminate in suppuration, but this hardly proves that the kidney is an organ which is not liable to idiopathic suppuration, a position that must be adopted if we decide in favour of the necessity of bladder disturbance for its production. The occurrence of cases of scrofulous suppuration about the kidney seems to me to settle this point,—that under certain conditions the kidney may suppurate independently of any external cause. Then as to Sir Benjamin Brodie's opinion, that the primary affection was in the kidney, and thence propagated to the bladder, we certainly do see a scrofulous state of the urinary passages starting in the kidney, and there seems some ground from some few of the cases in our records for assuming that in the case of circumscribed renal abscesses the inflammation may extend to the pelvis of the organ, and so to the ureter and bladder. Here again, however, we must agree with what has long ago been remarked by Rayer, that "it is rare that an inflammation primarily developed in the kidneys propagates itself to their excretory channels." The cases applicable to the illustration of this point may be found in a certain

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proportion of the cases of suppurating kidney out of the whole number of those occurring in general pyæmia. The appearances here exactly resemble the disease produced in the case of a local origin; the same spots of suppuration are found in the cortex; the same linear arrangement on section of the organ radiating from the papillæ as centres, and in some cases the pelvis participates in the inflammation. Short notes are subjoined of cases which may possibly bear this interpretation, and in which the bladder also was affected.

Suppurative Nephritis following Typhoid Fever.

George C—, æt. 32, admitted under Dr. Barlow, October 5th, 1864, and died on October 10th. He had been an out-patient for a week or two with diarrhœa, and, becoming worse, was admitted. He had great oppression of respiration, which became worse until death.

The kidneys were very large, and full of small purulent deposits. The pelvis was inflamed. The mucous membrane of the bladder injected and ecchymosed. Urethra healthy.

Mitral Disease; Suppurating Kidneys without evident Obstruction to the Urinary Passage.

Mary W—, æt. 60, admitted under Dr. Wilks, December 19th, 1866. There is no mention of any urinary trouble in the history, and she died entirely from heart disease.

The kidneys weighed nine ounces; they contained many round patches of suppuration. The ureters and bladder were very moderately inflamed. No constriction. Embolic patches were found in the lungs and spleen.

Burn; Pyelitis; Suppurating Kidney.

John B—, æt. 14, was admitted under Mr. Forster, April 17th, 1868. Both lower extremities were severely burnt. The burns were superficial. He was severely collapsed. The surface suppurated healthily. A short time after admission blood appeared in the urine, and albumen remained constantly present till death. He had had stimulants ordered freely;

they were discontinued, and he improved. He never had any difficulty in micturition or pain over the bladder. The post-mortem, by Dr. Moxon, is to this effect:—The kidneys were large. The right pelvis was rough and vascular. Numerous lines of suppuration led up from it to the cortex, where were numerous spots of suppuration; the left kidney also had one or two suppurating spots, yet it presented more the aspect of a white Bright's kidney; the other also had somewhat the same appearance.

Bladder empty; submucous ecchymosis one eighth to one twelfth inch in diameter; right ureter very vascular at its junction with the bladder, less so higher up; left ureter less affected.

Renal Calculi; Suppurative Pyelitis.

Harriet V—, æt. 37, admitted November 18th, died November 19th, 1868. She was under the care of Dr. Rees. Since childhood had had pain in the left side, and for the last year had had attacks of dysuria, with pain, passing pus in the urine. She was admitted, almost pulseless, with an attack of seven weeks' duration, and she died the next day. The kidneys were four times their normal size. Each pelvis was much dilated and hollowed out into a large cavity. A calculus was found at the orifice of each ureter. The pelves, distended, contained opaque, yellowish muco-pus. Right ureter a little injected; left not so. The bladder finely injected, and at one spot ecchymosed, but other signs of inflammation were not observed.

*Acute Necrosis of Tibia; Pyæmic Suppuration in Spleen,
Testicle, Liver, Kidney, and Lungs.*

Henry S—, æt. 14; admitted August 11th, 1868, under the care of Mr. Hilton. He had his leg crushed between a door and door-posts, and his leg swelled. He was admitted on August 11th, and died August 25th.

Mr. Howse thus reports of the post-mortem:—The heart had slight aortic vegetations; pericardium ecchymotic; lungs contained pyæmic abscesses, and the liver exceedingly numerous centres of suppuration; bile healthy; spleen suppurating; kidneys both extensively suppurating; they presented just the

appearances (both in an equal degree) ascribed to surgical kidney. There was acute pyelitis with inflammation of the ureters, evidenced by vascularity, granular appearance, and cast epithelium. Tracing this down, it was found to extend to the bladder on the left side, though not on the right. For a radius of an inch round, the opening of the left ureter into the bladder was congested. Bladder healthy, except to the extent described. No stricture or other urinary obstruction. The whole of the vas deferens was distended by pus; the epididymis being in a state of acute suppuration.

Admitting, then, its somewhat rare occurrence, facts seem to show that in occasional instances a suppuration may start in the kidney and be communicated to the bladder.

With regard to the second point, the information required is exceedingly difficult to obtain. Not every case of cystitis complicated with stricture goes on to suppuration of the kidney, and consequently a comparatively small proportion of cases of *simple* cystitis, admitting that some do, will reach that stage. As an actual fact, all the cases that might throw some light upon the matter are spoilt for the purpose, owing to the absolute necessity for the introduction of catheters and sounds into the bladder for the purpose of diagnosis and treatment. The statement has been often made that all the patients who die of suppurating kidney have been subjected to catheterism or some such treatment. It is quite true that many are thus treated; but what is that worth as an evidence of the cause of the disease? The very fact of their having undergone this particular treatment is in itself often the best evidence of mischief about the organs, which, had opportunity been afforded, might have led to suppuration; the conditions most favorable for the production of cystitis are also those requiring the use of the catheter; and as far as I know, facts to prove the other state of things, viz. freedom from catheterism in cystitis, the kidneys generally remaining healthy, are not forthcoming. Some other cases have just now been detailed in which a suppurating kidney existed without catheterism, but they are hardly conclusive at the present moment, as they might possibly be due to some pyæmic state. The class that would help us most, and might indeed settle the question, would be that of paraplegia, if it could be shown that the proportion of suppurating kidney was

much higher when catheterism had been resorted to than without. But here, again, few paraplegias are able to dispense with a catheter, and if they can, they are so nearly in a healthy condition as regards urination that there is no reason why they should get a suppurating kidney. The details on these points in the 56 cases that are collected together here, are not sufficiently explicit to help in the matter. Of the 13 cases in which catheterism was employed all had cystitis, and ten of the thirteen had suppurating kidneys, the other 3 cases being healthy, but in the larger number of healthy cases, whether catheters were used or not, is not stated.

I have not made these remarks with a view of controverting the notion that catheterism and suppurating kidneys are closely associated. On the contrary, I am imbued with the general impression from one or two cases that I have seen, that it is a happy thing for a man if, should he get paraplegia from any cause, his bladder becomes contracted, as is sometimes the case, and his urine runs away as it forms; it is fortunate for him if he does not require the catheter. I believe that the question cannot be approached satisfactorily from this point at all, and that we must get at it by some other way than that of clinical observation. That other way seems to be none else than experimentation with urine charged with the secretions from an inflamed bladder. Dr. Ferrier has done this. In the 'British Med. Journal,' vol. i, 1873, p. 429, in an article on "Septicæmia and the Catheter," he describes an experiment in which urine containing phosphates and mucus, but which was not ammoniacal, was placed in a heated flask. For a whole year it remained clear till examined again, when its simple contact with a glass rod was sufficient to induce putrefaction. As far as it goes this appears conclusive, but it still leaves open whether the product taken for this one observation was a fair sample for other cases; whether also it was as near to having suppuration exciting qualities as it would ever have, if the bladder were left to itself; whether it was as virulent in its power as any product of a mere vesical catarrh could attain to.

Dr. Ferrier's experiment further only goes to show that *putrefactive decomposition* is not likely to occur in urine uncontaminated by air. But as I have said, it is not quite proved that the putrefactive state is necessary to produce a suppurating

kidney. It is true Dr. Dickinson thinks ammoniacal urine the great suppuration exciter, and ammonia, according to Dr. Ferrier, is only produced by putrefactive decomposition; but how far pathological states not caused by putrefaction are liable to excite suppuration is still left undetermined. Dr. Dickinson says on this point, "The simple presence of pus or mucus in the urine, though lasting for years, does not appear to set up the renal disorder so long as the urine retains its acidity and resists putrefaction." Now, some cases of abscess about the kidney and prostate will discharge pus by the ureter into the bladder without setting up inflammation in the latter during many months. But will an inflamed bladder go on discharging for long periods without setting up the renal disorder? I am unable to answer this question in the affirmative by any case followed to a conclusion on the post-mortem table, but it does appear that cases of vesical calculus, and even old cases of stricture, will go on for long periods with intermittent attacks of muco-purulent urine, *i.e.* of cystitis, and yet live on. But with this it must also be remembered that the proportion of kidney disease is high in these cases; the proportion of cases with one side more diseased than the other is large, and it is possible that suppuration may occur in one organ and subside again without the doctor knowing much or anything about it.

While, then, it is uncertain as to how far a simple cystitis might have the power of exciting suppuration in the kidney if things were allowed to take their course, it is *quite* certain that in the great majority of cases the renal affection goes with a fetid and ammoniacal state of urine, and is dependent upon it, because the arguments which may be advanced in favour of the production of suppurating kidney by a simple cystitis will apply with much greater force to putrid urine, since it will, of course, still hold true that, the greater the departure of that fluid from the normal standard, so will the chances of suppuration be increased.

3rdly. That inflammatory products of special nature are influential in originating the disease must be allowed if my previous conclusions be sound. In the first place, it was the primary object of this paper to show the effect of a special poison—*erysipelas*—upon the kidney and urinary tract. Again,

it has been admitted that in most cases of renal suppuration a putrefactive state of the urine is noted, and we can even go farther than this. The putrefaction of urine is efficiently explained by its retention in the bladder, and its contamination by air as evidenced by experiment. But urine is one of the most readily decomposable fluids, and yet many patients—old stricture cases, for example—go on under these conditions for a long time, and then die, a fair proportion of them, at any rate, with an acute disease, and not by one which, having existed long before, has at last terminated in suppuration. The mere contact of a catheter, then, soaked in the ordinary atmospheric impurities, would not appear to be sufficient, else how could such cases as those now to be quoted be explained, and, further, alkaline urine often exists in these cases without apparently provoking suppuration.

A man, æt. 33, was admitted on October 2nd, 1857, with perfect paralysis of his legs and bladder after a fall. The catheter was constantly used till February 13th, 1858, when he died of extensive suppurative nephritis. It cannot be supposed that this man's kidneys were suppurating four and a half months. It is certain that he must have gone for a long time without any such changes.

Or to take another case, a man, æt. 68, was admitted in 1865, who had been in the habit of passing a large catheter for himself. The dresser passed one for him once on his admission. He was seized with rigors not long after, and died. At the inspection his right kidney was suppurating. The ureters were congested, and he had an extremely hypertrophied bladder. He had also cancer of the prostate and liver.

Other cases are those of which Dr. Dickinson mentions the occurrence, and I have also found notes of similar ones where death has occurred from suppurating kidneys, the bladder being found healthy. All such cases as these seem to point rather strongly to some special blood poison communicated by means of the catheter to the urine or wall of the urinary tract, and one cannot avoid the suspicion, loath as I am to entertain it, that here is an example of a species of hospitalism; that if these patients had kept outside, if they had had a catheter passed at their own homes, they would probably not have died of surgical kidney. It would be very interesting, if it could

be obtained, to get a record on this point of a large number of deaths in old stricture cases in private practice. They would, I suspect, give a much smaller proportion of suppurative nephritis compared with the less intense forms of inflammation.¹

The potency of operations in provoking suppuration might, I think, be deduced from the stone cases I have given; but here, again, are difficulties in the way of taking an estimate of any single cause when more than one abnormal condition exists. Operations for stone, except lithotrity, lay open the bladder to the external air, and thus may be said to favour, if not directly to cause, suppuration by urinary decomposition. Lithotrity was performed in eight cases, and in one only was the kidney found healthy. Of twenty-two cases of lithotomy the kidney was healthy in only one, and in two cases of perineal section both had diseased organs; but then in eight of ten of the patients not operated upon, the organs were also diseased, so that it is doubtful if the calculous affection, as it existed before any interference, was not already sufficient.

On the other hand, however, cases in which the bladder is simply laid open are represented by the group of carcinoma of the os uteri and bladder. Ten such are given, and in only three of them was the kidney suppurating, so that, allowing that in a larger number of cases the proportions might be altered, it appears in two thirds of these cases the mere contact of air with the urine had failed to excite a suppurative nephritis.

A case of ectopia vesicæ which seems of value on this head may be very shortly alluded to here. The child was fourteen months old, and therefore for that period had been accustomed to the dribbling away of its urine. It was operated upon by Mr. Durham, with a view to closing the bladder, by making an anterior wall from the abdominal skin above it. We may not unfairly assume, I think, that the surface representing the bladder must have been subjected in the manipulation of paring edges, &c., to many chances of inflammation, and at the post-mortem, in addition to the dilatation of the ureters and pelves, which would seem to be a common condition in such

¹ For an interesting case in connection with this point, and, so far as one case goes, direct evidence of the possibility of the occurrence of pyæmia and suppurating kidney without any contamination from external sources, the reader is referred to a note at the end of this article.

cases, from the puckering, I suppose, which is produced by the malformation about the vesical orifices of the ureters, the child had congested lines running through the cortex of the left kidney, exactly as in early stages of surgical nephritis.

To summarise our conclusions as we have done the headings of these remarks, I think the facts I have given and those by other persons before quoted bear me out in saying—

1. That the suppurative nephritis is generally secondary to disease about the bladder and to decomposition of urine.

2. That it may be produced without putrefaction of the urine, without any apparent disturbance from without, by the occurrence of retention, either in the bladder or pelvis of the kidney.

3. That the free communication between the bladder and external air has not a large share in most cases in producing suppuration of the kidneys, but this is not so at special seasons or when this condition is coupled with inflammation of the bladder, whether set up by decomposing urine or other causes.

4. That atmospheric conditions or particles, at particular times, more especially those having to do with erysipelas, are likely to induce the disease.

5. That surgical operations, in proportion to the intensity of the inflammation they excite, and the completeness with which they ensure that those inflammatory products shall be intensified by the admixture of air, are also fertile sources of disease.

I have been, I fear, somewhat prolix in thus breaking up the ground of possible causes of suppuration of the kidney without decomposition of urine, because so doing bears directly upon one of the great questions of the day as to the first cause of all suppuration.

Bacteria are in fashion just now, and no more ready explanation could be given, if they are essential to suppuration, than that they are the cause here, for what fluid is more apt than urine to generate these organisms at the earliest periods of decomposition. I wanted, if possible, then, to exclude certain cases from the category of suppuration having a bacterial origin, because, as I think, another explanation of their occurrence is more applicable, while in the cases that are assumed to be due to erysipelas poison those who believe in the bacterial origin of diseases of this kind, rather than the origin of bacteria as a mere result of changes common in certain tissues and fluids under any state of

decomposition, will probably not find it hard to say that the result is only as might have been expected—a disease commencing with bacteria has produced suppuration.

The question of the minute anatomy of this disease is also bound up with this question of bacteria. The latest description of its histology is, so far as I am aware, that of Dr. Dickinson, in the paper quoted before, in the 'Medico-Chirurgical Transactions' for 1873. The changes he there describes are, dilatation of the straight tubes, distension and clotting in associated blood-vessels, and disseminated interlobular suppuration, the distribution of which is regulated by the course of the veins. He further states that the disorder has its origin in the regurgitation of urine charged with morbid products; this, by transudation or some similar process, enters the neighbouring blood-vessels, and charges them with an infection resembling in its results that of pyæmia. This is distributed by the veins to the rest of the gland, sowing abscesses in their course, and ultimately causing constitutional symptoms analogous to those of pyæmia otherwise derived.

The abscesses are thus ascribed to embolism, as far as I understand the description, though I fail quite to see the *rationale* of the process. It may, I think, be objected that if clotting goes on in the veins, and the disease is disseminated by the dislodgment of these, rather, ought it to produce or tend towards a *general* pyæmia than to a local distribution of abscesses. How, indeed, unless some back current prevail—a hypothesis which would ascribe to a rare condition a common disease—can plugging in the pyramids infect the whole organ? The arteries may possibly participate in any disease which attacks the veins or parts around, but one would not willingly appeal to their aid, knowing how apt they are to remain untouched in inflammatory diseases in their neighbourhood. At the same time the theory of embolism is so simple, and explains so thoroughly isolated suppurations, that once it is entertained there is no limit to its capacity. Moreover, we must now give some attention to the question of bacteria, and must reconsider the arguments based upon the *probable* course of results, by the further known fact that these bodies, in addition to being *carried* by the stream, possess very active movements of their own, and thus may bring about conditions for which we should not otherwise be prepared.

But there is another side to the question, viz. the tendency of organs to modify the outward form of disease according to their composition and the relations their several parts bear to each other; for instance, why does the lung so frequently mould its diseases in the tubercular form?—why do certain rashes on the skin take each their peculiar traits? It is, perhaps, vague to say such is their nature, but I take this to be the fact, and so with the kidney—when it suppurates it does so in this disseminated form, not necessarily because it has emboli lodged it; and so, whether it be in a general pyæmia or in a local disease, the same characteristics are to be observed; further, the kidney has a tendency to suppurate in a special disease, viz. in acute necrosis of bones. This fact has been sufficiently dwelt upon by Dr. Moxon to make it needless to say more on the point, but its doing so is an additional point in favour of the view I urge, that the organ has peculiar tendencies, which are not to be judged of by other diseases alone, but from its own stand-point also.

Rindfleisch describes the disease as an interstitial nephritis, and, on the whole, I am disposed to agree with this view, leaving open the question of the carriage of the poison. The small points of suppuration unquestionably occur in the course of vessels, but, inasmuch as arteries, veins, and lymphatics, all run in the same connective tissue, it may seem at least doubtful whether all of them are not at different times or in different localities engaged in disseminating the diseased condition.

The changes, then, upon which I would lay stress are—1. A dilated and blocked condition of some of the straight tubes, while the tributaries to these may also show the same overgrowth of the epithelium, be collapsed and shrunken, and sometimes cystic. 2. A general nuclear growth in the cellular tissue around the vessels belonging to these parts, and a specially excessive growth of nuclei in the parts which are forming abscesses. I have not found clotting in the veins always present, though it is so frequently; but it is at least as likely that it occurs as a consequence of the disease outside them, as that it is a primary condition resulting in abscess. How to decide on the point it is difficult to see.

I look upon the disease, then, as a cellulitis of the kidney, and in so describing it, I wish to be understood to mean, not a

mere disease confined to the gland, but one attacking, let us say, the urinary cellular tissue as a whole, viz. that large mass which surrounds the organ, and which, looked upon as mere fat, is stripped from the organ as of no moment in its diseases, but which, nevertheless, is exceedingly commonly very dense and thick in old cases of urinary obstruction; the submucous cellular tissue of the ureter, and the submucous tissue of the bladder: the fact that suppuration of the kidney occurs more frequently in cases of operation about the bladder I look upon as evidence of this, because the said tissue is more directly involved, not because greater facilities are given for the decomposition of the urine, since that condition would certainly be counteracted by the surgical relief afforded by the free evacuation of the contents of the bladder.

Another important point in its pathology must also be specially insisted upon as explaining some clinical features, viz. that the distribution of the disease in the organ is a local one, i. e. each suppurating centre spoils a certain part, but yet leaves much of the cortical structure untouched. The inflammatory processes occur, first among the straight tubes, and the diseased parts are stopped off from the general stream of urine, and, therefore, by no means necessarily give evidence of their existence in the urine.

So much for suppuration of the kidney; but other conditions are met with, sometimes in connection with it, more often, as facts show, unconnected with it at all, but still the result of chronic obstruction. What are these conditions? They are in the prostate, sacculation and abscess; in the bladder moderate over-distension, hypertrophy and thickening of its muscular wall, muscular spasm producing contraction and sacculation of its cavity, paralysis producing dilatation. Given, then, a case of stricture of the urethra, or any obstruction about the bladder to micturition, will all these changes enumerated in all probability occur. If not, why not? This may not at first sight appear to be a question of much interest. All the same, the future of such a case depends upon the answer, and this, though apparently so simple, involves the consideration of very complex relations between the bladder and kidney. Let it be considered, for instance, why one patient has sacculation of the bladder, another dilatation, a third such contraction of its cavity that it

will hardly contain an ounce of urine. Why is this so thickened that in place of a line or two the wall measures an inch? Why is that, apparently with an equal amount of obstruction, not thicker than the healthy viscus? And then, having attempted to form some conclusion in any case upon the state of the bladder, what influence will the condition which we assume to be existing, have upon the kidney? Here is a case with a good kidney on one side, a much diseased one on the other; there suppuration in one associated with a wasted or, may be, quite a healthy state on the other; and I may remark that all these questions are based on facts and differences of common occurrence in the disease now under consideration. It is easy, upon a moment's reflection, to see how such conditions *may* arise; it is also not difficult to see how important such variations must be in any particular case, and yet how difficult it is to form an opinion. To take, for instance, one very interesting point in connection with the subject, why is it that *atrophy* is so constantly associated with obstruction? It may be said that the mere occurrence of permanent pressure is sufficient to induce an atrophy of the gland. This is very marked in some of the records of cancer of the bladder and uterus, in which, the growth having involved one ureter more than the other, atrophy has gone on on the affected side almost to destruction of the kidney, which, while retaining much of its external form, showed none of its proper structure, and in one case weighed only half an ounce. It is by no means clear why this should be so. As has been said before, we know nothing of the force which is represented by the excretion or secretion of fluid, what amount of weight expressed in pounds a given kidney is capable of raising by its products, what amount of tension force or pressure is capable of neutralizing the function of secretion. It will, I suppose, vary in each individual, and in the individual it will not be the same at all times, fluctuating as the constitutional tone and as the local blood-supply and stimulation, and according as the pressure or secretion force predominates so shall we get the morbid anatomy expression of it in the form of atrophy or cystic disease. Of course I do not here refer to any cystic condition which may possibly be due to any new growth—only to such as are called retention cysts, or which have that nature. In the former—atrophy—the scarred and shrunken parts that are found in

the kidney are no more than the evidence of balanced power, of rest and functionless inactivity; the latter—the presence of a cyst—shows the insufficiency of the pressure to neutralize the function of the organ.

From the cases here collected together it would seem that the most favorable condition for ensuring a complete atrophy of the kidney, or, indeed, the only state under which such a balance of power is procured, is the implication of only one organ. If complete wasting of one kidney is to be attained, it can only be by the other being capable of taking on the work. Supposing that one kidney becomes blocked by a calculus, or one ureter is obliterated by a growth in the bladder, if the other kidney be healthy the blocked organ will soon begin to show signs of shrivelling, and may dwindle down to a mere relic. If, on the other hand, the remaining kidney is not a capable organ, the blocked kidney will, I think, probably become cystic, and here lies the difficulty, and, perhaps, impossibility, of being able to decide the question propounded. So long as there are products to be excreted, so long, almost, does it appear that the kidney will do the work demanded of it, and thus hardly is there a limit to the secretion force when attempting to measure it by the pressure which will destroy it. The kidney may be truly demoralised, to enforce laziness is to ensure a wreck, and, just as with the mental faculties, the destruction brought about thereby is very complete. I have not thought it necessary to detail any cases illustrative of these remarks; they are common enough in our inspection records, and we are all familiar with the wasted kidney the result of pressure. Perhaps all are not so familiar with the one-sidedness of the condition, and even if a moment's thought be sufficient to show that, if observed at all, it must be unilateral, as we are not capable of going kidneyless, it is yet not at once apparent that such an extreme condition is dependent on one organ being left intact quite independently of the needs of the economy, merely as it is the only way of ensuring rest to the other organ.

Dare I venture to suggest that these very unpractical remarks have just a suspicion, if no more, of a bearing upon treatment. The operation of nephrotomy is advocated in the surgery of to-day. Such a proceeding may now and then be required in cases of renal calculus where the kidney structure is not

destroyed. The very attempt at it implies that an opinion has been formed in favour of the soundness of the other kidney. If these facts show that pressure on the ureter causes atrophy of the corresponding organ, it is just possible that pressure, by ligature of the ureter, would bring about a subsidence of calculous symptoms with the shrinking of the gland, and this, we cannot but think, at much less risk to the patient than by the excision of the whole organ. As to the feasibility of such an operation, those skilled in the surgery of this region must determine; but one may make the remark that, if surgeons are bold enough to excise the kidney, they will not mind attempting, at any rate, even though it be difficult, to *pick up* the ureter.

That in a large number of cases one kidney is much worse than the other is a point of special importance in relation to diagnosis and prognosis. The occasional occurrence of suppuration on one side only has been noted by others, but I wish to refer, not only to suppuration, but to a wasted condition also; and, taking these two states together, to insist upon, not the occasional, but the very frequent, difference in the extent of disease to be found in the two glands. Further than this, it is especially noticeable in certain groups of cases, as in stricture of the urethra and in cancer of the bladder. It is markedly absent in others, as in paralysis and cases of large prostate. Those in which it is absent have either acute disease or over-distension of the bladder, in which dilatation is present or hypertrophy of the muscle absent, while inequality of the disease on the two sides is found especially in those cases where great hypertrophy of muscle, and often a contracted state of the bladder, are leading conditions. It will be remembered that the normal anatomy of the ureters and base of the bladder is precisely such as would render it likely that in abnormal states of muscular action and thickening there might be an impediment to the outflow of urine from the ureters, and an unequal impediment on the two sides is by no means improbable. The ureters pass through the thickness of the coats of the bladder in a very oblique manner; they are, to quote Pettigrew, "covered externally and internally by the longitudinal, slightly oblique, and very oblique fibres of the bladder, from all of which they receive accessions. The very

oblique fibres, which are much the strongest, run nearly at right angles to the longitudinal fibres of the ureters."

Thus, there is a tendency during a contraction of the fibres to obliterate the ureters, and that this would be much increased in any hypertrophied bladder-wall is nearly certain. In addition to the obliquity of the vesical ends of the ureters and the plaiting round them of the muscular fibres, an additional security against regurgitation of urine is afforded in the healthy state by the exceeding thinness of the walls of the ureter as they open in the bladder, so that even in cases of mere prolonged distension this valve-like arrangement must be compressed by the urine contained in the bladder, and some amount of temporary obstruction result.

In cases, then, of paralysis of the bladder from disease of the spinal cord, where the conditions are recent, it might be expected that, if the kidneys suffered, they would be likely to do so to an equal extent, and that in all old cases of urinary obstruction, putting aside those cases in which there is an obvious implication by disease of one ureter more than another, according as the bladder is in a dilated condition or a contracted one, so will the two kidneys be alike in the extent of their disease or different, especially if we bear in mind the very frequent association of thickened muscle with puckerings and sacculations.

Difficult, if not impossible, as the existing condition will be to predict during life, it will yet be a question of much importance in individual cases as obscuring the diagnosis of the patient's state. If, with previous cystitis, the bladder be contracted, or if there be any decided history of what is called an irritable bladder for any length of time, at any period of the case, then there will be a probability that the kidneys are not in a similar state as regards disease. But if we are unable to obtain particulars, either by history or examination, as may very possibly be the case, the diagnosis of the exact condition will be one of the greatest difficulty.

During the past year or two, surgical kidneys have received a somewhat large share of professional attention, and positive statements have been made that it is possible, by the aid of the microscope and quantitative analysis of the urine, to settle the state of a patient's kidneys when he is suffering from old stricture, &c. I thought then, and am more decidedly of the

same way of thinking now, that such an opinion was in many cases anything but correct, and that the tests proposed to be applied in such instances would not stand against a wider experience. I should say this with some diffidence if only speaking on the chemical side of the issue, for though I had hoped to have carried out an extended series of observations on this point, the duties attaching to the office of Surgical Registrar at Guy's have been too intrusive to allow of the intention being carried into effect. Still, in the few instances which have been investigated it has seemed very doubtful if the excretion of urea was at all decreased. Thus—

CASE 1.—A man suffering from very old stricture had had perineal section performed, and was in the tremulous, cold, drowsy condition generally ascribed to uræmic poisoning. The urine was collected as well as it could be under the difficult circumstances of the case, but it is probable that not much more than half the urine actually excreted was obtained. The actual quantity measured was fourteen ounces. It was alkaline, sp. gr. 1017, and contained 199·38 grains of urea. Taking this at so much per ounce, which is obviously the only fair way of estimating the quantity excreted in this case, we get 14·21 grains per ounce, a result which is up to the required standard. This man subsequently died, and his kidneys, though not on the whole bad, still showed on one side a large patch of wasted cortex equal to about a third of the side surface.

CASE 2.—A boy was admitted with acute necrosis of his tibia and severe pyæmia. He had pericarditis, and as it was probable that the organs attacked would be in a similar state in his case as in others of the kind, and that the kidney would be suppurating, all that I could get of his urine—only three ounces, for he was insensible and very restless at the time—was carefully examined. It was alkaline, turbid, dark straw colour, sp. gr. 1015, without albumen, and contained 13·14 grains of urea per ounce. He died next day, and the kidneys were studded with minute points of suppuration, the heart and the lungs also containing abscesses.

CASE 3.—Mentioned in the early part of this paper as having curious pyæmic symptoms, with calculus in the bladder. Was

passing urine of sp. gr. 1007, alkaline, ammoniacal, without albumen, in quantity three pints in the twenty-four hours. It contained 591·59 grains of urea.

CASE 4.—Referred to previously as Isaac L.— Was passing six days before death 433 grains of urea, the urine being acid. Five days before, the urine being neutral, he passed 482 grains, the relative amount of solid to fluid being the same as before, but the quantity excreted being rather more, and the twelve hours before death he passed thirty ounces of urine, both alkaline and ammoniacal, sp. gr. 1020, a quarter of it pus, but with 328 grains of urea in it.

CASE 5.—A patient, admitted with an enlarged prostate, had puncture per rectum performed. His urine was pale straw, alkaline, containing phosphates and pus, sp. gr. 1012. He passed only thirty ounces in the twenty-four hours. The albumen was small in amount; the thirty ounces contained 295 grains, or 9·83 per ounce. This then was rather diminished, and while others died passing a usual amount, he went out well, although the damage to the kidney was presumably greater in his case than in the others.

We can see at once, from the pathologist's point of view, why this is. The disease in question will not uncommonly leave one kidney entirely untouched; it will generally leave a good part of both quite capable of work, and this even in the most severe forms of the disease—in suppuration of both kidneys. We examine the kidneys by the microscope, and in many cases the greater part of the cortical substance remains intact; it is not so in Bright's disease, which is an affection of the whole organ. Moreover, I think it is not unfair to argue that, just as the depriving a patient of one kidney will nearly certainly lead to the other doing double work, so in a local disease like this the parts not affected in both organs will do duty for those that are.

Then, again, as to the microscopical examination of the urine, I have found casts in the urine certainly, but if any one thinks these are to be found in all cases he is very much mistaken. What is the condition of the urine? Very generally consisting in great part of viscid, slimy, decomposing pus, and

the search becomes as difficult as that in the old adage of the needle in the haystack.

But the chemical or microscopical part is not, as I hope, by any means all the question. The clinical histories of uræmia and suppurative nephritis are not the same. If the urea is considerably diminished, ought not evidence to be given of it by uræmic symptoms, prominent among which is to be noted *reduction*, not increase, of temperature? On this point I suppose most are now agreed, that uræmia, while it produces the stupid condition of mind, the dry glazed tongue, the muscular tremor of fever, yet is not accompanied by heat of surface. It is needless to recount authorities for this—enough that it is a fact. Now, these cases of suppurating kidney mostly have a high temperature. They are being treated for stricture in the hospital, when suddenly shivering occurs and increase of surface heat. Would this happen under uræmic states? Death comes, it is true, not unfrequently by a comatose state, but this may very possibly be due to blood poisoning of a septic nature, and perhaps, as has been suggested, may have nothing to do with the kidney, but rather depend upon absorption of decomposing matter from the surface of an inflamed and ulcerating bladder.

Then, again, supposing that in chronic cases death is caused by gradual extinction of the kidney structure, it would not be unfair to assume that, in a fair proportion of cases, a hypertrophied condition of the heart would be found, as in other cases of chronic disease of the kidney. I cannot find that this is so. In only two or three of a large number of the cases in our records, which I examined with special reference to this point, was the organ notably enlarged; it ranged frequently to eleven or twelve ounces, which is rather above the average, but no more. The reason of the absence of uræmic symptoms is, from an explanation already given, very obvious. Then, in relation to the question of the possibility of spontaneous cure of suppurating kidney, the difference often found on the two sides is of the highest importance. Looking at the disease even in the acute form, as one merely attacking small patches of the organ, it is possible, one may suppose, that such a condition may subside and the patient get well. Dr. Wilks and Dr. Moxon both recognise pathological conditions which they ascribe to old cured suppurations about the kidney, and I myself remember a patient

under Mr. Hilton's care some years ago who after amputation of the arm had pyæmia and passed a considerable quantity of blood in his urine. He, however, just escaped with his life, and we had no opportunity of examining his kidneys. He might, of course, have had merely an acute nephritis, but it is more probable that he had the condition known as suppurative nephritis.

The *treatment* of suppurative disease of the kidney is more simple, it would appear, than in many other maladies, since the question of cure by medical aid does not enter into our calculations. It resolves itself simply into the question of how to prevent it. Supposing a patient to have surgical kidneys, he may get well, and the more readily, perhaps, as has been said, if only one and not both organs be affected, but by no means in our power can anything be done towards directly curing the disease. Prevention, on the other hand, would seem to be perfectly possible, and lies within our province, and we most persistently neglect its attainment. Granting or not the general applicability of Dr. Ferrier's conclusion, that the urine is not prone to undergo putrefactive changes, "so long as there is no direct source of impregnation from putrefactive germs from without," no surgeon refuses to acknowledge the association of the disease with catheterism. There is no one but must admit that the urine, when exposed to the air, is a readily decomposable fluid, and that the exposure of large cavities or surfaces abnormally to external influences forms *the* great anxiety of surgery, so likely is it to be followed by suppuration and septic or suppurative fever. Recognising this well in other parts of the body, large chronic abscesses, &c., are left alone as long as possible, and in cases of necessity free incisions are made in place of limited ones, so that no retention of decomposing fluids may occur.

In the case of the bladder, however, all the ordinary rules of surgery are departed from, and its cavity is exposed without proper precautions to external influence. One man will have a catheter retained, another may have a canula passed in through the rectum. By neither of these, to say nothing of the various major operations for stone or stricture, can the urine be constantly flowing, and probably by neither is there complete exclusion of air from the bladder, or, which comes to the same thing, from a practically stagnant column of urine in communica-

tion with its mucous surface. Decomposition very readily ensues, and with what result all are but too familiar. How very different is the usual method of procedure for paracentesis thoracis. In that case every precaution is taken, yet, as far as I can see, the one part is not more important than the other. The conditions existing in either case are not altogether parallel, because the bladder, being a muscular viscus, contracts as it empties, and so is probably, unless full of urine, at no time in any sense a cavity, as the pleural sac must be. But then the size of the sac matters nothing; the smallest area of mucous membrane subject to contamination from without is surely capable of starting a putrefactive process which will be communicated to the entire organ.

The difference in the methods of treatment carried out in the two diseases lies, we must suppose, in a spirit which is perhaps akin to the contempt said to be engendered by familiarity. The one class of cases is so common; catheters are passed over and over again, and do no harm, therefore, some special conditions are necessary to produce suppuration in the kidney, and it would neither be wise nor convenient to submit every case to the trouble of what, in a large number of instances, would be needless precautions. Much truth lies, no doubt, in this argument, and *perhaps*, in dealing with isolated patients, the said precautions would not be necessary; but where a large number of persons are aggregated together, as in a hospital, inasmuch as we do not know certainly what the peculiar conditions are, which are necessary to the production of the disease, it would, I believe, be only right and proper that some further measures should be taken than are in general adopted now. Besides, though only a few of the great number of stricture cases get suppurative nephritis, many more have cystitis and febrile symptoms. If only these could be avoided a great gain would have been accomplished, since often does one see the successful treatment of stricture delayed by pyrexia, and of all the troublesome cases to cure what more tedious than one of chronic cystitis? But, looking away from stricture and such troubles to diseases and injuries which issue in paraplegia, we find that half of all the cases that die have suppurative nephritis. They do, indeed, die directly from that state. Could this heavy cause of mortality but be averted, and half the number of cases would be

saved, or have life prolonged, let us hope, to use their brains for the benefit of their fellows.

The preventive treatment may be carried out under two different conditions, that is to say, by anticipating the chance of decomposition of the urine, or by destroying the putrefactive property when it has arisen, and curing the cystitis which such a state has caused.

To ensure the first, it has been proposed to use carbolized oil in place of the common oil when lubricating catheters previous to their passage, and to this I have only to add that in all cases where it is necessary or advisable to retain an instrument in the bladder, in case of paraplegia, enlarged prostate, &c., it would surely be not too much to ask that the same method should be adopted as is used in paracentesis thoracis, viz. that an india-rubber tube should be attached to the catheter as soon as the latter has been passed, and the urine then be allowed to drain away under water, the free end of the tube being immersed in some disinfectant fluid by the bedside.

In the other class of cases, where the bladder is already inflamed and the urine decomposing, we have to aim at the complete evacuation of the urine and an adequate disinfection of the bladder. To accomplish these ends is not easy. The disinfectants in vogue at present, or rather as at present used, are utterly incompetent, I believe, for the purpose, from the fact that they can only be used in diluted solutions, and are only temporary in the benefit they impart. To make their application of permanent service some means must be devised for their constant contact with the diseased surface, though it is difficult to see how this can be effected. There can be little doubt that, could it be performed without setting up inflammation, the best thing in many cases would be to lay open the bladder by the median or lateral lithotomy incision, taking care by this means that the urine should run away as it formed.

This cannot be done, however, because, as I think statistics show, operations about the bladder considerably enhance the probability of the occurrence of suppurating kidney. Thus, though we may see that where the bladder is closely contracted, or thoroughly drained by a fistulous opening, disease of the kidney is less liable to occur, we are unable to take advantage of this plan of treatment. Failing this, it is indeed difficult to

know what to do. In some cases it might, perhaps, be possible to arrange a constant flow of a disinfectant solution into and out of the bladder, but this, again, would be troublesome, and in many cases impossible, from the requirement of the passage of a catheter of the largest bore.

To face a difficulty is to find an escape from it. It probably will be so in this instance. What is wanted for these cases is a disinfectant which, not caustic enough to harm the bladder, shall yet be all powerful in completely arresting decomposition. In the antiseptics, as now applied to the vesical mucous membrane, we have no such remedy, and, I venture to say to the surgeon with all deference, we are at present incompetent to deal with much of the disease occurring in the bladder. But with such a wide field of observation—for decomposition of the urine is a common occurrence—such a state cannot long continue. Surely, by trying the various drugs, some one or more can be discovered which will fulfil the required conditions, while the practical results which may be expected to follow will well repay the investigator. The inquiry is one of no mere local importance—I mean local in respect of its relation to one set of organs—though in this light only its value cannot be over-estimated; but it should add to our knowledge, where we are now most ignorant, some observations on the action of disinfectants.

Germs and bacteria are nowadays said to be potent in their evil influence. What will kill them or stop their action? The surgeon with his cases of cystitis is dealing with a fluid which abounds in these bodies, and in demonstrating what is a disinfectant to putrid urine he may show what is or is not destructive to the life of these low organisms.

NOTE.—Since the completion of the foregoing article it has occurred to me to have to make the inspection of a case of old stricture with suppurating kidney and pyæmic pneumonia, where it was hardly possible that the patient could have come by his death through the instrumentality of the catheter.

I am glad to be able, with the kind permission of Mr. Davies-Colley, under whose care the case was admitted, to make use of the notes of it in this addendum.

It will be seen that, with a single exception, and that three years before his death, the man had, till his entrance into the hospital, never had a catheter passed. Admitted on January 19th, he died on the 22nd, a period so short as to be insufficient, I think, for the development of the conditions found post mortem. His urine was never ammoniacal, though pungently offensive at the time of death.

Frederick L—, æt. 48. When a boy he had nocturnal incontinence. At the age

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of twenty he had gonorrhoea twice, and has never passed a full stream of urine since. He enjoyed good health till six years ago, when he had pains in either groin and much sweating. Four years ago he passed blood with his urine twice or three times. Three years ago, having difficulty in making water, his medical man passed a catheter along the urethra, and, finding it arrested about three inches down, he desisted, his object having been attained in ascertaining the presence of a stricture. No force was used, and no bleeding followed. Since then he has had no instrument passed, and a month ago a swelling came in the perineum; it got better under medical treatment, but returned again a week ago. He then had retention, which was not relieved by general treatment, and he was, therefore, sent at once to the hospital.

On admission he had a perineal abscess, which was opened in the median line, the urethra being subsequently incised. A No. 8 elastic catheter was passed into the bladder and tied in. The urine drawn off was very much the colour of weak milk tea, but was quite inoffensive. He was in a low condition. He died on the 22nd.

Before death seven ounces of urine were collected, and presented the following characters:—Sp. gr. 1010; straw colour, turbid, containing a good deal of ropy pus; offensive, alkaline, but not ammoniacal. Bacteria present, but not in great quantity. Pus-cells had a tendency to arrange in very wide tubular moulds. The seven ounces contained as nearly as possible 60 grains of urea.

Autopsy.—The lower lobe of the left lung had an ash-coloured slough, an inch in diameter, on its surface, communicating with a large pyæmic abscess, of gangrenous nature beneath, the centre of which was now sloughing out as a necrosed mass. Lungs elsewhere healthy. Heart 11 oz. Kidneys 11 oz. Capsules thick. Right, small and very puckered on the surface, and with its pelvis much dilated. Pyramids obliterated. The whole organ pale and fatty, but not suppurating. Left kidney suppurating in many minute points all over, much larger than the other, and pelvis less dilated. It also had irregular puckerings from old wasting. Pelvis on both sides full of milky urine, but not injected. Ureters both distended to the size of the little finger.

Bladder irregularly dilated. A large pouch protruded on the left side, overhanging the left ureter. Muscular coat very thick and trabeculated.

Mucous membrane a little injected.

The membranous urethra was much diseased, being ulcerated, and communicating with burrowing abscesses in the perineum and about the pubes. Three separate strictures of the passage existed—one, just anterior to the bulb; a second, $2\frac{1}{2}$ inches along the canal, very cartilaginous; the third, a very narrow band at the base of the glans.

A CASE
OF
EXCRETION OF UREA BY THE SKIN.

BY FREDERICK TAYLOR, M.D.

THE necessity for the removal of nitrogen from the body, and the frequency with which the kidneys fail in this their chief function, make it of the greatest importance to ascertain by what other organs and to what extent the materials usually passed in the urine may be discharged.

With regard to the water, there is no doubt that the skin and kidneys act to some extent vicariously, and that the sudoriparous glands separate urea,—the most important nitrogenous constituent of the urine,—has been clearly shown by Funke and Favre.

The case which follows is an example of abundant excretion of urea from the surface of the skin, occurring in the fatal collapse of uræmic poisoning.

The notes are from the report of Mr. J. Lacey Morley.

M. A. M—, æt. 31, was admitted into Clinical Ward under Dr. Owen Rees, October 2nd, 1872.

The patient is unmarried, and has never had children; she works at the sewing machine.

Family history good. She has always enjoyed good health; is not accustomed to drink; never takes spirits, and rarely beer.

For the last five months has vomited almost daily about

two hours after dinner, rarely after other meals, and has often experienced pain and uneasiness at the pit of the stomach, the pain frequently shooting between the shoulders.

She has never brought up any blood, and can keep small quantities of food down.

Menstruation has ceased for the past five months. She says she has always been accustomed to vomit at the commencement of the catamenial period.

She suffers much from frontal headache and from flatulence; her bowels are open daily. She has no cough. She complains of depression of spirits, feels better some days than others, and has lost flesh and become much weaker.

Her eyesight has been getting dim. She says she has fits, which come on every three or four weeks, in which she remains insensible for an hour or two, but is not convulsed. She feels very drowsy for some hours afterwards; does not foam at the mouth, nor scream out when seized; says she has suffered from swelling of the eyelids, and has been obliged to pass her water three or four times during the night for about twelve months; has never noticed any swelling of the ankles.

On admission.—The patient has a very dejected appearance, is thin and anæmic, and has some cedema of the eyelids.

Chest well formed, the mobility good, resonance normal; breathing rather deficient on the right side in front.

Heart, strong impulse felt over an increased area, extending outside the left mammillary line for one inch; the apex beat rather lower than normal and to the left of the nipple.

The first sound is indistinct, the second sound unnaturally sharp.

Pulse small, compressible, 110.

Liver dulness extends rather lower than usual.

Urine pale, rather cloudy, of specific gravity 1010, containing a considerable amount of albumen; no casts are to be found.

On October 3rd she was ordered—

Misturæ Ammoniacæ Acetatis, ℞, 4tis horis.
Pulv. Jalapæ comp., ʒij, statim.

October 5th.—Bowels only opened once; has passed one pint of twenty-four hours; has but little appetite; no

œdema of the eyelids ; had a kind of fainting fit last evening, which lasted about five minutes ; no struggling, foaming at the mouth, nor calling out. Was ordered to be dry cupped over the loins.

7th.—The cupping removed the pain from the loins entirely. She complains of feeling worse ; is more low and weak ; her memory has failed much the last few days ; she has vomited three or four times since the last report ; had no sleep last night, pain at the chest being so severe ; has now much pain at the pit of the stomach and over the præcordial region. In this situation is heard a loud to-and-fro bruit, loudest at the right of the nipple, not heard in the axilla nor at the angle of the scapula, rather increased by pressure.

The heart-dulness is not increased towards the clavicle, and no thrill is communicated on palpation. Pulse 108, small and compressible. Lung-sounds normal. Resp. 24 ; temp. 97·8°. She has passed rather more water. Eats but little. Was ordered brandy 4 oz.

8th.—She vomits nearly all she takes.

There is less pain over the præcordial region ; no increase in the vertical heart-dulness ; a marked thrill on palpation.

The pericardial rub is much altered in character, is harsher and louder, and very distinct for three inches along the right edge of the sternum.

The urine is rather opaque, pale, its specific gravity 1010, and the albumen is abundant. Pulse 120 ; resp. 24 ; temp. 97·2°. Was ordered—

Emplastrum Lyttæ nuchæ.

*Pulv. Jalap. co., ʒss, statim, et repetatur si
opus sit quartis horis.*

9th.—The patient had a fit lasting a quarter of an hour this morning ; she was much convulsed ; she now lies semi-comatose, moans a great deal when moved for examination (this makes it difficult to auscultate). The pupils are normal, of sluggish action. The rub appears softer ; the pulse 110, small, and very compressible. Bowels opened ; no vomiting.

There is great difficulty in inducing her to take food. Ordered beef tea and milk enema.

10th.—She had a convulsive fit this morning that lasted for five minutes ; is quite unconscious ; moans night and day ;

pupils normal; passes motions and urine under her, but retains partly the nutritive injections. The bruit is much softer. There is some puffiness of the left wrist; the radial pulse on the left side has never been so distinct as on the right; frequency 100.

11th.—Her condition is similar to that of yesterday. She takes nothing but brandy and milk. The pupils react to light, and there is some puffiness of the eyelids. Rub very audible; pulse 100, weak.

She has had several short convulsive fits of the following nature:—She lies with the head thrown back, the eyelids half closed, the mouth partly open, the eyes turned up, twitching of the eyelids, and quick spasmodic contractions of all the muscles of the body; quick, jerky respiration during the fit; occasional sighing respiration as it is passing off.

The fit continues four or five minutes, and the patient is drowsy and heavy afterwards.

14th.—Is alive, and nothing more. Takes no food of any description. Pulse 100; resp. 20. Has had no fits since the night of the 11th.

15th.—Patient died at 9 p.m. yesterday.

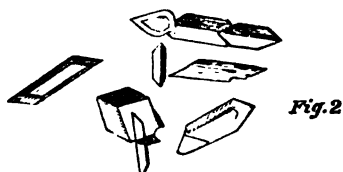
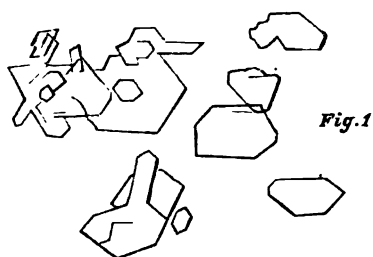
Two days ago a peculiar appearance was presented by the face and hands. On these were numerous white masses thickly studded in groups, which appeared to contain some calcareous matter. The patient's face looked as though flour had been sprinkled over it.

The appearance here mentioned was due to a deposit of saline matter upon the surface of the skin. When I last saw her, within a few hours of death, it still covered the face and part of the neck, being more abundant in some parts than others.

It was moderately adherent to the skin, and I was obliged to scrape with some force when removing a specimen for further examination.

Under the microscope it was seen to consist of small, white, irregularly shaped masses, with crystalline prisms and spiculæ projecting from them. The deposit was nearly com-

pletely soluble in water and rectified spirit, leaving behind in each case oily drops of various sizes. The crystals obtained by evaporation of either solution were long prismatic needles. On adding to a drop of the solution a drop of strong nitric acid flat hexagonal crystals resembling those of nitrate of urea were obtained (fig. 1).



When a solution of the specimen and one of oxalic acid were mixed together, rhomboidal prisms of various sizes were deposited, and the same shot out from the surfaces of crystals of oxalic acid placed in a drop of the solution (fig. 2).

These tests were necessarily applied to small quantities of the material, but the results show clearly that urea was present and in considerable quantities. The existence of this substance was confirmed by Dr. Stevenson, who was kind enough to examine some of the specimen for me; he also obtained a reaction with the acid nitrate of mercury, but only after separating the urea from chlorides, by solution in absolute alcohol.

The following notes are from Dr. Moxon's account of the inspection, made seventeen hours after death.

Mary Ann M—, æt. 31; brown hair, grey eyes, round face and features, slight development, short stature. No trace of dropsy.

Brain 46 oz., neither anæmic nor congested, appeared quite healthy. No effusion of blood or softening; vessels tolerably healthy.

In both lungs, especially the upper lobes, were several small patches of hepatization.

Heart weighed $11\frac{1}{4}$ oz. The left ventricle hypertrophied and firmly contracted, its wall $1\frac{1}{4}$ in. in thickness.

Aortic valves healthy.

The right side not hypertrophied.

Muscular fibre firm; a little fat.

Recent acute pericarditis; a complete layer of lymph on the back of the heart; the front patched with it; no trace of fluid effusion.

Stomach rather deep red and coated with tough mucus, empty; alimentary canal in the same state throughout, quality of mucus varying as usual.

Liver 46 oz., natural, but flabby, and rather pale and bloodless. The capsule thin.

Gall-bladder full of thick, mucoid, dark bile, coming easily into the duodenum on pressure.

Spleen very small ($2\frac{1}{4}$ oz.).

Kidneys 5 oz., shrivelled and irregular in figure; excellent examples of granular change; the cortical portions, both interpyramidal and superficial, much wasted, the pyramids less so.

Uterus rather large and congested.

Vagina inflamed acutely; several patches resembling pus were visible in the tissue of the mucous membrane.

No gout in the great toes.

The occurrence of such cases is not very common; a few are recorded by Leube,¹ Deininger,² and Kaup and Jürgensen,³ and its occasional appearance on the skin of patients suffering from cholera has been described by Schottin and Drasche.

The efflorescence seems to have been very similar to that

¹ 'Deutsches Archiv für Klinische Medicin,' Bd. vii, p. 1.

² Id., Bd. vii, p. 587.

³ Id., Bd. vi, p. 55.

seen in some of the cases above mentioned, and might have been described in almost the same terms; thus, in one case "it appeared as if the patient's face had been soaped by the barber;" in a second, the appearance was similar; in a third it presented itself as a "whitish covering, resembling hoar frost, and sandy to the touch." In three of the cases in which the minuter details of the deposit are given, it consisted of elongated, colourless, rod-like structures, and their identity with urea was shown by their solubility in water and alcohol, and by their yielding with nitric and oxalic acids characteristic crystals of the nitrate and oxalate of urea respectively.

In the case of Mary Ann M— the crystals did not entirely answer to this description, the majority of the masses being colourless and irregular in shape, but after solution in water or spirit, long needle-like crystals were obtained on evaporation. The chemical examination showed decidedly the presence of large quantities of urea, but also, according to Dr. Stevenson, of a sufficient amount of chlorides to interfere with the formation of a precipitate with acid nitrate of mercury.

The resemblance of the present case to others being confirmed by an examination of the deposit, it will be well to note the clinical and pathological conditions which have been observed to accompany the phenomenon of secretion of urea by the skin.

And, firstly, in the great majority of cases it has been preceded or accompanied by a suppression, partial or entire, of the functions of the kidneys. Of the cholera patients it is said that "all, in the typhoid stage, showed a urinary secretion materially diminished, or even entirely suppressed;" and in at least four of the cases which were independent of cholera, disease of the kidneys was present. To this series may be added my own, making a fifth, since the kidneys were marked examples of granular degeneration, and the patient's death was preceded by symptoms characteristic of uræmic poisoning.

How much urine, if any, was passed in the last few days of life I have been unable to ascertain; the report makes no mention of the condition of the urinary secretion later than four days before death, when it states she passed urine and motions under her; but the coma and convulsions which were

¹ Kaup and Jürgensen, loc. cit., p. 55.

observed at this time and afterwards until death, sufficiently indicated the failure of the kidneys to perform their functions. I must not omit to mention that in two recorded cases the kidneys were healthy, one patient having chronic catarrh of the bladder and retention of urine, the other dying of ileus. The case before us agrees further with those previously observed in the marked absence of even moderate dropsy, and in the fact that the sweating took place spontaneously during a state of collapse. This has been followed by death in all cases but one;¹ and there, though recovery was the result, the perspiration was cold and viscid, burst out after six days' anuria with uræmic symptoms, and had ceased before a slight increase of temperature and diminution of the convulsions suggested hopes of a return to health, the phenomena differing in a striking manner from those seen in the critical perspiration of a fever, and indicating rather a state of extreme collapse, of which the perspiration formed a part.

Agreeing so far with other observations, the case adds little to what may be learnt from them, either as explaining the occurrence itself, or as bearing upon the pathology of Bright's disease. It is, moreover, incomplete in that no examination of the blood was made for the presence or the relative quantity of urea. Nevertheless, if the free secretion by the skin were caused by an unusual amount in the blood, this itself would require explanation, for the pathological changes and the clinical conditions were not different from what has been before noticed in cases of renal disease, when this accident has not occurred.

In the absence of an analysis of the blood, there is nothing to oppose the conclusion expressed by Kaup and Jürgensen, at the end of their paper, and founded partly on the cases in which renal disease was wanting, that the phenomenon must be referred to the "long duration of the death struggle"—to "long agony and profuse sweating."

This is, perhaps, hardly an explanation until we have more information on the nature of the death-sweat, which differs, at least in its mode of origin, from the ordinary perspiration due to increased vascularity of the skin, and is allied rather to that of fear and of the faintness preceding vomiting, or of syncope

¹ Deiningcr, loc. cit.

from other causes. These are all forms of cold sweat, and though the dependence of some of them on nerve disturbance is obvious, a more detailed physiological explanation of the process is wanting.

One is reminded here of the two kinds of saliva secreted under the influence of different nerves; the one scanty, but rich in specific constituents, especially mucus, therefore tenacious, and frequently gelatinous, its secretion coinciding with a contracted state of the vessels and the passage of very dark blood into the veins; the other fluid, thin, and abundant, and proceeding from a gland, the blood in which flows bright red through dilated arteries and pulsating veins.

Further researches on the nature of the perspiration occurring under different circumstances, and, if possible, on the nervous connections of the glands, would be required to establish any similarity between the cases.

With regard to its bearing upon therapeutics, the richness of the perspiration in urea at first suggests the more frequent use of diaphoresis as a method of treatment, not only for the removal of fluid in anasarca, but also to get rid of excrementitious material in chronic Bright's disease without dropsy. But a consideration of the circumstances already pointed out, under which the secretion has been observed, will at once show that they are very different from those accompanying the use of the hot-water and Turkish baths, our most efficient diaphoretics; for in these, as the temperature is raised, the vessels dilate and the whole surface becomes hyperæmic.

We must, therefore, still look to further experiments and trials of diaphoresis before we can say to what extent the skin may be substituted for the kidneys.

Leube's analyses show that it may be made to relieve them in healthy persons to a small extent, since during free sweating the urea passed by the kidneys was distinctly diminished, and on this he founds a recommendation of the bath as a therapeutical agent.

Liebermeister¹ had previously treated the dropsy of chronic morbus Brightii by the hot bath, and had come to the conclusion that the secretion of urea in the urine was not at all influenced by the application of diaphoresis. Moreover, he

¹ 'Pragervierteljahrschrift,' vol. lxxii.

was only in two cases able to obtain from the perspiration crystals which resembled urea, but were in too small quantity for identification.

These experiments, as well as those by Funke,¹ show that by sweating, as produced by exercise and external heat, urea can only be obtained from the skin in quantities very much less than is seen in the cases under consideration; and they so far second the suggestion that we may find in the physiology of the sudoriparous glands some explanation of the free excretion by them of this important compound.

¹ Carpenter, 'Principles of Human Physiology,' 6th ed., p. 420.

TOXICOLOGICAL CASES.

By THOMAS STEVENSON, M.D.

Poisoning by White Precipitate.

A FATAL case of poisoning by white precipitate is so rare that an account of the effects of the poison on a patient who died in the hospital may not be uninteresting.

White precipitate is a mercurial preparation which, though a persalt of the same class as corrosive sublimate, is yet so insoluble in water and other neutral menstrua that it is usually esteemed to be but slightly poisonous, and that a fatal issue need hardly be looked for after its administration to a healthy adult. It is also not very readily decomposed by saline or highly dilute acid solutions, such as the gastric fluid, and hence the ingestion of white precipitate has often been considered to be by no means an alarming accident. Nevertheless, since white precipitate is liable to undergo alterations when exposed to air and light, whereby corrosive sublimate is formed, and is also liable through carelessness in the manufacture to be imperfectly freed from the corrosive sublimate used in its preparation, accidents, sometimes fatal, have ensued after the administration of these impure forms of the compound; but in these instances the fatal results have been generally attributed rather to the sublimate present than to the precipitate itself. Yet it has been abundantly proved that white precipitate is a poison even when entirely freed from corrosive sublimate. We need only refer to the researches of Drs. Pavy and Taylor (*vide* these 'Reports,' 1860, ser. 3, vol. vi, p. 483) for proof of this statement.

In the year 1872 an adult woman was admitted into the hospital suffering from profuse salivation, and she died about a week after taking the poison (white precipitate) in unknown but considerable quantity in mistake for magnesia. My notes of the case, except of the post-mortem examination, were unfortunately destroyed by an accident. I may state, however, that the symptoms were profuse salivation, fœtor, sloughing of the gums, and death from exhaustion. Symptoms of intestinal irritation, such as would be produced by corrosive sublimate, were absent. The account of the post-mortem is of interest.

Post-mortem examination.—*Gums* extensively corroded and fetid; the alveoli exposed, and several of the teeth dropped out;—these effects most marked in the lower jaw. *Stomach* with hour-glass contraction at the distance of one third of its length from the cardiac end. The mucous coat partially removed by post-mortem solution, ecchymosed in patches, corrugated. *Small intestine* pink, and in appearance very like a diarrheal intestine, except for three feet at its lower end; here it was dark and slaty in colour. The *cæcum* more especially, and the large intestine throughout, were also of a slaty colour, and in some places mottled, as if there had been small ulcers at some antecedent period, with extravasations of blood around them. The *cæcum* itself was red and injected (chronic inflammation). The anterior edge of the lower lobe of the left *lung* was dense, pale, and spleen-like in texture, though it still contained air. *Heart, liver, kidneys, and brain* healthy. *Uterus* and *ovaries* healthy, and apparently those of a virgin.

Poisoning by Binoxalate of Potash.

Mary Ann S—, æt. 27, was admitted under the care of Dr. Pavy. One hour and a half before her admission, whilst perfectly sober, she purposely swallowed “a pennyworth of salts of lemon.” In two or three minutes, it is said, she threw up her arms and fell down in a state of insensibility. In half an hour an emetic was given by a druggist, but without inducing vomiting. One hour after swallowing the poison she had partially recovered consciousness, but still spoke somewhat incoherently.

When first admitted, one hour and a half after taking the

salts of lemon, she was in a semi-conscious state, and had a vacant stare. The mucous membrane of the mouth and pharynx was injected, and the tonsils were enlarged, but there was no loss of membrane. The eyes were half open. Pupils normal. She groaned a good deal, but either could not or would not answer questions. She coughed occasionally. There was no tenderness over the abdomen. Temperature normal. Pulse 128, small, but not easily compressible. She had not vomited since taking the poison. An ounce and a half of chalk mixture was swallowed without difficulty.

Fifteen minutes later the tube of the stomach pump was passed. This operation was immediately followed by the vomiting of half-digested fish and other matters. Two hours after partaking of the poison the urine was passed and examined. Nothing abnormal was noted in it.

Half an hour later she answered questions addressed to her when put in a loud tone, but spoke somewhat incoherently. Half a pint of milk was swallowed with ease.

The patient next morning, twenty hours after the taking of the poison, was perfectly conscious. The pupils were normal. She complained only of slight tenderness of the abdomen, and soreness of the throat and mouth. There were a few slight excoriations on the inner side of the lips. The tongue was furred and flabby. Swallowing was still performed without difficulty. Temperature, pulse, and urine normal. The bowels had acted once only.

Two days later the patient was discharged convalescent.

I found a trace of an oxalate only in the vomited matters.

This case well illustrates the rapid onset of symptoms in poisoning by binoxalate of potash. The salt has been known to kill within eight or ten minutes of its administration.

Poisoning by Mushrooms.

The following case of poisoning by *Agaricus stercorarius*, observed and communicated to me by my friend Henry Hicks, Esq., of Hendon, possesses much interest. The symptoms produced were entirely referable to an action upon the nervous system, and intestinal irritation was absent. It is known that mushrooms produce two classes of symptoms—gastro-intestinal,

referable to irritation, and narcotic symptoms. Sometimes the one class and sometimes the other predominates, the two being associated together; but in other cases narcosis is alone observed, and the case here reported affords a typical and striking instance of this.

The case is also of further interest, since the fungi which were eaten (*Agaricus stercorarius*) have not usually been deemed particularly deleterious. *A. stercorarius* is very closely allied to the common mushroom (*A. campestris*), but is distinguished from this by its very large spores. Another allied species, however, *A. semi-globatus*, is known to be poisonous.

R. M — æt. 39, an engine driver on the Midland Railway, when leaving work at the Hendon station, on the 12th instant, took home with him what he supposed to be good mushrooms, (which proved, however, to be *Agaricus stercorarius*), which he had gathered about an hour before in a field containing mangold wurtzel. When they were given to his wife to prepare, she told him she was sure they were not mushrooms, and mentioned, as reasons for her opinion, that they were darker in colour, much more brittle, and did not feel like those she had usually seen. He, however, persisted in saying they were all right, and had them stewed with bacon. He was in excellent health at the time, and ate very heartily of them. No one besides in the home partook of any, and it seems that he must have eaten altogether about as many as could be contained in a pint measure. In half an hour afterwards he complained of slight nausea, some oppression in his breathing, and of severe pain across the forehead, with giddiness. His wife now noticed a strangeness in his appearance, and that in attempting to walk he kept his eyes fixed on the ground and guided himself with difficulty. He was, however, quite conscious of everything, and opened a book to see if he could read, but found that he was unable to make out any of the letters. He also expressed a wish to go out of doors, in the hope that by walking he would get rid of the giddiness and dimness of sight, believing strongly that it was only "a bilious attack," and that it did not arise from the mushrooms. When out of doors he continued to suffer severely from the pain across the forehead, with giddiness, and, in addition, experienced a feeling as if

there was something continually over his head, or as if passing "through an arcade." He also staggered much, and it was with difficulty he kept from falling.

About 10 p.m., more than three hours after he had eaten the mushrooms, Mr. Hicks was called to see him. He found him sitting down, in a semi-state of stupor, with pupils dilated and inactive, and the pulse slow and feeble, from 55 to 60. On being roused and made to get up he looked completely bewildered, staggered as if tipsy, and said he could not recognise the things in the room, nor the room itself as that which he had usually occupied. He now became more restless, threw his arms about, and seemed to be anxious to be continually moving from place to place. He also appeared to be somewhat convulsed, with twitchings of the muscles of his face, and complained of prickings in his hands and of a feeling as if they were swelling. A strong mustard emetic was administered, and afterwards Mr. Hicks left the house to fetch some sulphate of zinc, as the mustard did not seem to produce any effect.

He had not left him more than a few minutes before a messenger followed to tell him that he had suddenly become more excited, and that he had rushed wildly out of the house into the street. Dr. Andrew now accompanied Mr. Hicks, and they found him in a neighbour's house, which he had succeeded in reaching, considerably prostrated after his exertions, and in a very lethargic state. Twenty grains of sulphate of zinc were now administered, and in a short time vomiting ensued, much dark fluid with numerous pieces of the fungi being brought up.

For a short time afterwards he expressed himself as feeling better, and was allowed to be taken to the door of the cottage. Almost immediately afterwards, as if moved by a sudden impulse, he again rushed wildly out, but after going a short distance stopped suddenly, as if bewildered. Emetics were again administered, and the stomach thoroughly washed out by the stomach pump, and in the course of a few hours he gradually recovered, though feeling much prostrated.

He said that during the whole time he was quite conscious of what was being done, but that at times he felt drowsy and inclined to sleep. When the convulsive paroxysms came on he

felt wild and excited, with an irresistible desire to move about and to run.

He had no pain whatever in the stomach or bowels at any time, nor did the feeling of oppression in his breathing continue after the first symptoms.

Poisoning by Mussels.

Richard G—, æt. 23, was admitted under the care of Dr. Pye-Smith, on March 5th, 1873.

At 7 p.m. he took about a quart of mussels; ten minutes after, he commenced coughing. This continued for about an hour, when vomiting came on, and was repeated at short intervals until admission.

8 p.m.—A raised rash with white heads came out all over his body. The itching was intense in about an hour and a half. The whole of his body became bright scarlet.

8.30 p.m.—Upper and lower eyelids commenced swelling.

9 p.m.—Muscles of face and extremities became rigid, and twitched excessively.

10 p.m.—Was seen in the surgery. Temp. 97.4° ; pulse 132. Upper and lower eyelids were very œdematous, conjunctivæ much injected. The whole surface of his body was covered with a scarlet rash, only slightly raised. Complained of great abdominal pain. Spasmodic twitchings of all muscles of body, especially of face. Swallowed an emetic (Zinci Sulp. gr. xl). with great difficulty; said he had great pain in his throat.

10.15. p.m.—Vomited freely; matter consisted of half-digested fish, &c. On being put to bed he lay with his legs drawn up on his abdomen; his intellect was clear complained of soreness of all his limbs. Has an anxious expression.

March 6th.—Great pain in all his limbs and abdomen; says his tongue feels too large for his mouth. Is very thirsty. The skin has resumed its normal colour, there is no itching. Urine contains no albumen. Bowels not opened. Ordered low diet and a saline purgative.

7th.—Complains of cramp in his stomach; pains in limbs somewhat diminished, his neck is stiff, glands behind sterno-mastoid enlarged; has vomited twice during the night. Temp. normal.

8th.—Vomited a large quantity of frothy matter; cramp in stomach as before. Slept but little during the night. Temp. 98·4°; urine scanty, bowels have not acted.

9th.—After taking a dose of castor oil his bowels were freely opened; expresses himself as feeling much better. Vomited once during the night a small quantity of frothy matter. Temp. 98·4°.

11th.—Vomiting has ceased; all pain has left him. Glandular swelling unaltered. Complains of general weakness.

13th.—Discharged convalescent.

I am indebted for notes of this and the last case to Mr. Nelson Kiddle.

This case exhibits in a striking manner some of the usual symptoms which follow the ingestion of poisonous shell fish. The substance which acts as a poison is entirely unknown.

THE VALUE OF
PALPEBRAL AND SUB-CONJUNCTIVAL
ECCHYMOSIS,

AS A SYMPTOM, ANATOMICALLY AND EXPERIMENTALLY
STUDIED.

By R. CLEMENT LUCAS, M.B., B.S.

INJURIES in the neighbourhood of the orbit are of such daily occurrence, and the phenomena attending a "black eye" are so constantly under observation, that it may appear to some but a waste of time on my part to attempt to define the limits of the blood effused, or to endeavour to trace the relations that it bears to the injury received. But, when it is considered how widely different may be the causes, which give rise to effusions of blood in the eyelids and beneath the conjunctiva—at one time a slight contusion on the margin of the orbit, and at another a fracture through the base of the skull—it will, I think, be allowed, that a careful study of the more trivial accident is likely to lead to a more exact knowledge of the characters, which may be considered diagnostic of the more severe, and that on these grounds the subject is deserving of some attention.

Before commencing to describe the effects of injury in the vicinity of the orbit, I will first briefly notice the anatomical peculiarities of the part, since upon these, any differences between the results of contusion here and elsewhere must necessarily depend. The first to attract attention will be the bony margin of the orbit, which, by its prominence, affords so good a protec-

tion to the eye, that I believe it to be almost impossible for any injury to occur to that organ from a fall upon a flat surface. This margin is, however, not rounded off in its whole extent, as might, for the sake of uniformity or perfect symmetry at first sight seem desirable, but it is especially prominent at the upper and outer angle. In consequence of this, and of the vascularity of the superficial structures, any slight blow at this point gives rise to very considerable subcutaneous hæmorrhage; and I think it may be shown that this effusion, which so rapidly takes place, is designed to serve as a further protection to the eye itself. It is, at any rate, remarkable, that at the time when prize-fighting was common and unrestricted, the combatants, who could scarcely hope to escape the inconvenience of palpebral blood tumours, rarely if ever received permanent injury to the organ of vision. With adult age the contents of the orbit become more fully protected than in youth, by the development of the overhanging frontal sinuses, and by the greater prominence acquired by the superciliary ridges.

It is interesting, moreover, to observe, that the nerves and vessels, which escape from the interior of the orbit to supply the skin in the neighbourhood, are found only to cross the inner and more protected half of the margin of the orbit; and, further, that the largest and most important, viz. the supra- and infra-orbital vessels and nerves, pass through the margin in foramina, and thus obtain complete security from any such injury as might accrue to them from blows upon the circumference of the orbit. From these observations I am inclined to think, that the blood poured out as the result of contusion can rarely be other than capillary, since even the smallest arteries and veins lie in positions that appear to secure for them entire immunity from injury. Of the vessels in the neighbourhood, the anterior branch of the temporal artery is the one most liable to be ruptured at the point where it crosses the somewhat sharp margin of the temporal fossa. I have seen an instance of a small aneurism of the vessel, which had formed at this point as a result of injury, the patient having fallen some weeks previously and struck his head violently against the margin of a box.

The skin of the eyelids is peculiarly thin and supple, being by its nature admirably adapted for the frequent and rapid movements to which the lids are constantly subjected. For the

same reason the skin is loose, that of the upper eyelid being very abundant, so that even during sleep the fold it makes when the eyes are open is seldom quite obliterated. When these peculiarities are considered in their relation to palpebral ecchymosis, they will be found to account for two of the conditions met with; owing to its looseness and elasticity, the skin offers little or no resistance to the blood effused beneath, which, therefore, rapidly collects and distends it; and the delicate texture of the integument probably allows a certain amount of oxidation to take place through it, in consequence of which, the blood, when extravasated in small quantity or partially absorbed, assumes a purple-red in lieu of the blue-black colour that it presents in other parts.

It is, however, upon the loose-meshed areolar tissue and its freedom from fat that the peculiarity of palpebral ecchymosis mainly depends. This tissue allows fluids to be diffused so readily through it, and is capable of such great distension, that it differs in these respects from the areolar tissue of any other part of the body, the scrotum, perhaps, only excepted. The frequent variation in the quantity of the fluids which normally occupy the interspaces of this tissue is a matter of common observation, and a falling in of the lid at the margin of the orbit together with a dark areola are among the earliest indications of nervous depression, exhausting discharges, or any disease interfering with the proper nutrition of the body. Provided with this singular areolar tissue, and lying deeper than the surrounding surface tissues, the lids not only become distended when blood or serum is effused into their substance, but they serve as drains, which collect fluids extravasated or effused into the neighbouring parts. Hence, it by no means follows that a palpebral ecchymosis is due to injury in the immediate vicinity of the lids, for by this drainage action the blood may have been collected from parts lying at a considerable distance from the margin of the orbit. The fibres of the orbicularis palpebrarum muscle, which come next in order from without inwards, form a pale layer superficial to the palpebral ligament. The frequent movements of this muscle will tend to diffuse throughout the lids any fluids extravasated within them; and I think it not improbable that its concentrically arranged fibres may exert during contraction a certain suction action upon the surrounding tis-

sues, and in this way expedite, or be accessory to, the gravitation of fluids into the eyelids.

Beneath the palpebral portion of the orbicularis muscle lies the palpebral ligament, a membrane of considerable interest in the present inquiry, since it is of sufficient density to obstruct, for a time, at all events, the passage of extravasated blood. It is attached peripherally to the margin of the orbit, and centrally to the anterior surfaces of the tarsal cartilages near their free edges. Blood extravasated as the result of a blow upon the margin of the orbit, or gravitating into the lids after a contusion of the forehead, nose, or temple, will lie superficial to this structure; whereas blood poured out in the cellular tissue of the orbit from fractured skull, or other cause, will show itself beneath the conjunctiva, and internal to or beneath this fibrous septum. It becomes, therefore, a matter of very considerable importance in diagnosis, to determine whether blood extravasated into the lids superficial to the palpebral ligament is capable of making its way to the ocular conjunctiva, and *vice versa*. On this point Dr. Hodges¹ remarks, when speaking of blood gravitating from the forehead to the eyelids, "This infiltration invariably limits itself to the external or subcutaneous parts of the eyelids, the aponeurosis described preventing its penetration inwards. No trace of it is ever found in the ocular conjunctiva." And again, further on, he says, "If, on the other hand, the ocular conjunctiva is the seat of a traumatic ecchymosis, either (1) the globe of the eye has received a direct contusion, or (2) an escape of blood has occurred within the orbital cavity." Were this the case the diagnosis of injuries to the head would be greatly simplified. A blood effusion showing itself in the cutaneous surface of the lids, but not beneath the conjunctiva, would be characteristic of a superficial injury in the neighbourhood of the orbit; and a discolouration of the conjunctiva would indicate escape of blood into the cavity of the orbit from a fracture of the base of the skull, or an injury to the eyeball itself. I think, however, that I shall be able to show that blood may, without much difficulty, find its way from the lids to the ocular conjunctiva at one particular point, and that, therefore, no very definite conclusions can be drawn from the apparent limiting action of the palpebral ligament.

¹ 'Boston Medical and Surgical Journal,' April, 1878.

My attention was first drawn to this about four years ago, when a man came under my notice at the hospital after having fallen from a scaffolding some six or eight feet in height. He had pitched upon his forehead, and the mark of the blow was about its centre, but more over the left than the right orbit. Being but slightly injured, he did not present himself at the hospital until two days after the injury, and he then came to seek advice for his black eyes. At this time an abrasion was evident at the spot before indicated, and the forehead was swollen, but not ecchymosed; the lids of both eyes were distended and discoloured, the left being more so than the right, and the extravasated blood was noticed to have run in beneath the ocular conjunctiva of each eye in a direction from the outer canthus towards the cornea. The blood lying beneath the ocular conjunctiva caused a bright red stain of triangular shape, the base of which corresponded with the outer canthus and a portion of the lid below, the apex to the equator¹ of the eye near the cornea. The stain in the left eye was broader than that in the right, and reached to the margin of the cornea, where it ended abruptly. In the right eye it fell short of the cornea, and presented a more pointed termination. In this case the blow was single and at a definite point, and the blood poured out as the result of the injury had made its way into the eyelids of both eyes, distending and staining them throughout their whole extent. It had, moreover, although superficial to the palpebral ligament, turned round the outer canthus, and, after filling the loose fold of conjunctiva between that angle and the eyeball, passed on beneath the ocular conjunctiva towards the cornea. Owing to the contusion being situated more over the left than the right eye, a greater quantity of blood had gravitated into the lids of the former, and a larger stain was noticed beneath the conjunctiva of that eye. The blood on this side had travelled inwards until it impinged upon the outer edge of the cornea, where, owing to the intimate adhesion of the conjunctiva, its course had been suddenly arrested, and the stain ended in an abrupt concave margin.

Repeated observations have tended to confirm this conclusion,—that extravasated blood finding its way into the lids in any

¹ A term first applied by Haller to an imaginary line drawn around the eye transversely through the centre of the cornea.

considerable quantity will commonly make its way beneath the conjunctiva of the eyeball, and that it does so at a definite fixed point, by running in at the outer canthus in a horizontal direction towards the cornea.

Lest, however, I might have been led into error by the statements of patients as to the cause of the extravasation, and perhaps have overlooked a blow upon the eye in those cases where the blood appeared beneath the conjunctiva, I performed the following experiment upon the dead subject, in order to observe the course taken by fluids when extravasated into the eyelids. The point of a hypodermic syringe was passed beneath the skin of the upper eyelid, close to the eyebrow and about its centre, and a mixture of ink and water was then injected and made to distend the lid. This fluid was observed to make its way past the outer canthus to the lower lid, which it also discoloured. It further passed in beneath the conjunctiva at the outer canthus, so as to distend the pouch between that angle and the eyeball, and by gently imitating the movements of the lids the fluid was made to pass readily inwards towards the cornea.

The explanation of the course taken by fluids when injected or extravasated into the upper eyelid is very simple. The skin of each lid forms with the palpebral conjunctiva a fold, into which the palpebral ligament and tarsal cartilage dip, so as to form a diaphragm, which separates the superficial areolar tissue and orbicularis muscle from the areolar tissue of the orbit. The margin of the fold is so pinned, as it were, along its greater part to the subjacent tarsal cartilage by the insertion of the roots of the eyelashes and the Meibomian glands, that no fluid can pass by to the under surface of the septum. But at the outer canthus the skin is only loosely attached to the underlying parts, and the fluid is able to pass round the external tarsal ligament, and so reach the ocular conjunctiva. Its further horizontal course towards the cornea is probably determined by the conjunctiva being less firmly attached to the equator of the eye than elsewhere, and also to the absence here of the pressure of the lids during the time that the eyes remain open. If, however, the extravasation be great, the whole of the ocular conjunctiva may be separated from the eyeball up to the margin of the cornea; but this seldom occurs except in those cases in which the

blood is originally poured out within the orbit. At the inner canthus the tendo oculi and lachrymal apparatus appear effectually to obstruct the passage of fluids from the lids to the conjunctiva.

The following case, which occurred in the practice of Mr. Birkett, is a typical instance of ecchymosis of the eyelids and conjunctiva, resulting from contusions of the upper part of the forehead and scalp.

A. F—, æt. 45, whilst “larking” with a friend, fell down stairs, a distance of about twelve feet, and struck his head upon some stone flags at the bottom. The accident occurred between four and five o’clock in the afternoon, and he was brought insensible to the hospital. There was a large bruise above the right frontal eminence, and others on the scalp and back. There was no bleeding or discharge from the ears. About the middle of the night following the injury the lids of the right eye commenced to swell and to become discoloured. The swelling continued to increase for some hours, and the extravasated blood passed in from the outer canthus beneath the conjunctiva as far as the cornea, giving rise to a bright red stain on the anterior surface of the eyeball. The lids of the left eye did not become ecchymosed until two days after the injury, and on this side no blood appeared beneath the conjunctiva. The symptoms of concussion continued for ten days, after which the man made a good recovery, whilst the extravasated blood became absorbed in the regular way. In this case the contusion was situated at some distance from the orbit, and it was some hours before the blood appeared in the eyelids. It became first evident in the lids of the eye nearest the seat of injury, and, after gradually distending them, passed in beneath the conjunctiva of the eyeball. On the left side it was not until the second day after the injury that the blood appeared in the eyelids, and then not in sufficient quantity to pass beneath the conjunctiva.

I am indebted to Mr. Durham for the following case, in which ecchymosis occurred in the eyelids and beneath the conjunctiva of both eyes, after severe contusion of the lower part of the face.

F. S—, æt. 17, a healthy lad, of a dark complexion, with large eyes, was standing upon the deck of a steamboat, when the bow-

rope, in swinging round, struck the back of his neck and threw him forcibly forwards on his face against the bulwarks. He was not stunned, and received no injury to his head. On being brought to the hospital he was found to have a fracture of the lower jaw, and a laceration of the upper lip, dividing it vertically. The whole of the lower part of his face was most extensively contused. The eyelids of both eyes were distended with blood, and it had passed in at the outer canthus of each eye, beneath the conjunctiva, to the outer margin of the cornea. The subsequent absorption of the extravasated blood passed through the stages presently to be described, and was completed on the twenty-fifth day. There was in this case no injury to the margin of the orbit, nor contusion of the forehead; the blood, passing in the direction of least resistance, had collected in the eyelids, and involved the conjunctivæ of both eyes.

I might cite an almost indefinite number of similar cases, but think enough has been said to prove conclusively that sub-conjunctival ecchymosis may result from superficial injuries of the anterior part of the head and face, when no blow has been received on the eye and no fracture of the bones can have occurred. The practical application of these observations will be to detract from the diagnostic value of sub-conjunctival effusion in cases of suspected fracture of the base of the skull, when associated with contusions so placed, as to afford blood that may trickle in considerable quantity into the eyelids, and they serve to support the following remark made by Mr. Prescott Hewett¹ when referring, in a clinical lecture, to this symptom:—"You cannot possibly, under any circumstances, say that a fracture exists if the blow has been over the orbit." I would have it specially noted, however, that the blood in these cases invariably passes in at the outer canthus, and occupies, for the most part, the outer side of the eyeball.

Although the course I have described is that usually taken by extravasated blood, it occasionally happens, that a large quantity of blood may be collected in the eyelids, without any of it finding its way beneath the ocular conjunctiva. An instance of this I have recently seen in Lydia Ward, under the care of Mr. Bryant. An old woman, after severe contusions of the anterior part of the head and face, was admitted into the hospital in a state

¹ 'Medical Times and Gazette,' p. 89, vol. i, 1872.

of insensibility. There was bleeding from one ear, and the lids of both eyes were distended with blood, but none appeared beneath the ocular conjunctivæ. It was evident, that no conclusion could be drawn from the nature of the black eyes as to the probability of a fractured base of the skull, but the confinement of the extravasation to the eyelids was a point of interest. In cases such as these I have always found the palpebral fissures to be small, so that the lids, when open, remain firmly applied to a considerable portion of the anterior surfaces of the eyes, and the conjunctiva makes a deep fold between the external tarsal ligament and the eyeball. The blood, when extravasated superficial to the palpebral ligament, has, in order to reach the eyeball in the way I have described, to make a double or sinuous turn—first, from before backwards around the external tarsal ligament, then from behind forwards around the fold of conjunctiva between the ligament and the eyeball. It is clear, then, that the deeper the fold of conjunctiva the greater distance will the blood have to travel to reach the eyeball, and the extent of pressure exerted upon the fold by the united lids external to the outer canthus will depend mainly upon the length of the palpebral fissure. In the case above alluded to, by separating the eyelids, I was able to see the blood staining the conjunctiva beneath the external tarsal ligament, but it had failed to pass round the fold of mucous membrane, owing to the depth of the latter and the pressure exerted upon it by the eyelids.

Blood effusions into the eyelids are peculiar in that they very rarely excite inflammation or suppurate. This has been remarked on by Velpeau,¹ and so well explained that I cannot do better than quote his words. Speaking of ecchymosis in this region, he says, “Elle n’est presque jamais accompagnée ni suivie d’inflammation, ni même d’induration bien prononcée, de bosses, ni de dépôts sanguins. Il leur est si aisé de se propager au loin, les couches organiques qui recèlent le sang, ont une telle puissance d’imbibition, que les fluides sont presque dans l’impossibilité de s’y rassembler en foyer.”

Sub-conjunctival ecchymosis arising from a ruptured vessel within the orbit may occur as a result of a direct blow upon the eyeball, but this form of injury, for anatomical reasons already stated, I do not think to be of common occurrence. Another

¹ ‘*Dé la contusion dans tous les organes,*’ p. 74.

cause of extravasation in this situation is any sudden and violent arrest of respiration and circulation, such as occurs in whooping cough, in severe vomiting, and such as results from crushing blows upon the abdomen and thorax. Lastly, it may be a sign of fracture of some part of the bony wall of the orbit. An instance of ecchymosis caused by the effort of coughing in pertussis I have lately seen among the out-patients. There was some blood in the lids of both eyes, as well as beneath the conjunctivæ, but the case presented little worthy of note beyond the interesting connection of the symptom with its cause. The two following cases, that have recently been in the hospital, show how sub-conjunctival ecchymosis may result from crushing injuries of the abdomen and thorax.

C. M—, æt. 32, a fireman on board the Thames boat, was admitted under the care of Mr. Bryant, May 2nd, 1873. He was employed in cleaning the engines during the time that the boat was moored to Southwark Bridge, and whilst he was thus engaged the tide caught the paddle-wheels and set the machinery in motion. The crank of the engine, in turning, struck him in the abdomen and jammed him against an iron stay. In this position he was held until the engines could be eased back half-a-turn. He was brought to the hospital in a state of insensibility. The eyelids of both eyes were much swollen, and there was general ecchymosis beneath both conjunctivæ. There was considerable bruising of the abdomen, but no blood was passed by stool, and his urine remained clear. He was able to sit up at the end of three weeks, and the absorption of the ecchymosis was completed on the twenty-seventh day after the injury.

(A very similar case has been related by Mr. Bryant in the 'Guy's Hospital Reports' of 1860.)

J. A—, a girl eight years of age, was attempting to climb into a swinging-boat (which at the time contained two or three children), when the boat swung round, and, after knocking her down, fell upon her back and crushed her against the ground. She was admitted into the hospital, under the care of Mr. Birkett, December 27th, 1873, soon after the accident. At this time she was suffering from dyspnœa, sickness, and some symptoms of collapse. There was general ecchymosis in both

eyes, as well as some in the lids and cheeks. The heart was found pushed over to the right side, and the left side of the chest was tympanitic. The next day the eyelids became more swollen, but at the end of a week the blood extravasated beneath the skin had become absorbed, and that portion of the ocular conjunctiva pressed upon by the lids had become nearly clear. A fortnight after the accident a triangular red stain remained on either side of each cornea. Ten days later the blood on the outer side had become absorbed, save a speck close to the margin of the cornea. That on the inner side was completed on the thirty-fifth day after the accident. The child still remains in the hospital, and is believed to be suffering from a rupture of the diaphragm.

Hæmorrhage into the orbit, resulting from a fracture of the roof, may collect in two situations—either between the bone and its loosely adherent periosteum or on the ocular side of that membrane, and in each case the blood may make its appearance externally. In order to trace the course taken by the blood when poured out in one or other of these situations, I performed the following experiments:—After removing the brain from the skull, a small hole, of sufficient size to admit the nozzle of a fine injecting syringe, was bored through the roof of the orbit, care being taken not to wound the periosteum. The nozzle of the syringe was then introduced between the periosteum and bone, and the hole closed with wax. On injecting a mixture of ink and water it was found that when in small quantity the fluid remained near the seat of introduction, but on continuing the injection it made its way into the upper eyelid, and thence into the lower, and finally, after distending the lids, passed beneath the ocular conjunctiva from the outer canthus inwards. In fact, after breaking through the attachment of the palpebral ligament to the margin of the orbit, it appeared on the anterior surface of that membrane, and followed exactly the same course, and gave rise to precisely the same appearances, as a palpebral extravasation produced by a superficial injury over the orbit. An ecchymosis such as this might be expected if either of the ethmoidal arteries were ruptured, as it passed from the orbit to supply the meninges of the brain; or if blood from venous sources escaped in sufficient quantity between the periosteum and bone.¹

¹ Since writing this I have seen a fracture of the base of the skull which involved the outer angle of the orbit and ruptured the recurrent branch of the lachrymal artery.

In other subjects I passed the nozzle of a syringe through the periosteum, and injected the coloured fluid into the cellular tissue of the orbit. In these cases the fluid quickly appeared beneath the ocular conjunctiva before staining the lids, and on continuing the injection the whole of the conjunctiva became discoloured, separated from the eyeball, and chemosed. The discoloration of the conjunctiva was by far the most marked sign in these experiments—the fluids appearing subsequently in the lids, and never filling them so completely as in the previous injections. It is when blood pursues the course illustrated by the foregoing experiment, in a person who has received a severe injury to the head, that the surgeon can with the greatest certainty diagnose a fracture of the wall of the orbit. But it is not necessary that the fracture should have extended through the roof of the orbit in order to produce these symptoms, for a fracture through any part of its boundary would yield a similar result. Thus, Mr. Holmes¹ has related a case in which general sub-conjunctival ecchymosis followed a fracture and partial dislocation of the malar bone. These cases, however, occurring only from direct blows, and very rarely, owing to the strength of the bones of the face, can influence but little the diagnostic value of the symptom in fractures of the base of the skull. The following case is a good instance of hæmorrhage into the cellular tissue of the orbit caused by fracture of the base of the skull. It is further of interest as a rare example of fracture by contrecoup.

C. H—, æt. 24, was admitted, February 1st, 1872, in a state of insensibility, into Cornelius Ward, under the care of Mr. Poland. He had fallen from a considerable height, and struck the back of his head against the ground. He died within twenty-four hours. There was a large effusion over the back and left side of his head, and general sub-conjunctival and palpebral ecchymosis of both eyes.

On post-mortem examination a fissure was found running down the occipital bone on the left side, crossing the foramen magnum, and ascending on the right side of the basilar process, through the apex of the petrous portion of the temporal bone, to end at the side of the sella turcica. Quite separate and dis-

¹ 'Association Medical Journal,' 1855, p. 967.

tinct from this were two symmetrical injuries of the orbits. A round piece, half an inch in breadth, was cut out of the right orbital plate, and lay quite free. On the left side a very similar piece had been broken away from the left orbital plate.

In my injections of the cellular tissue of the orbit through the roof I found that the coloured fluid, after staining the conjunctiva, commonly darkened the upper eyelid before the lower, and first at the superior and inner angle, where the palpebral ligament is thinnest. It is possible, however, that when blood is poured out slowly it may gravitate so as to show itself in the lower lid before the upper, a condition originally held by Velpeau to be characteristic of a fracture of the base of the skull. The proportion of cases is not large in which the symptom that is the subject of this paper proves of service in practice. Mr. Prescott Hewett¹ found that out of twenty-three cases of fracture involving the roof of the orbit neither palpebral nor sub-conjunctival ecchymosis appeared in eight, in five cases the blood was confined to the lids, and in the remaining ten cases it so occupied the conjunctiva and the eyelids as to be characteristic of the injury. I would suggest that in the five cases in which ecchymosis manifested itself in the lids only, the hæmorrhage probably took place between the periosteum and the bone, the former remaining unruptured, and that if the discoloration of the lids was unaccompanied by contusion of the anterior half of the head, fracture of the orbit might have been suspected.

In rare cases a large branch of the ophthalmic artery has been wounded by a fracture of the roof of the orbit, and a traumatic aneurism has resulted. In these cases, in addition to general sub-conjunctival ecchymosis, the eyeball is protruded and pulsates, its mobility and power of vision are impaired, and the pupil is dilated.²

Having now remarked on the principal causes of ecchymosis in the lids and beneath the conjunctiva, and pointed out the peculiarities of each, I will briefly state the relation that the position of the blood bears to the injury received.

1. Blood may collect in the eyelids as the result of a super-

¹ 'Med.-Chir. Trans.,' vol. xxxvi, p. 340; 'Holmes's System of Surgery,' vol. ii.

² 'Med.-Chir. Trans.,' vol. xxii, p. 184.

ficial injury in the vicinity of the orbit, and after distending them may pass beneath the ocular conjunctiva, in which case it invariably spreads beneath that membrane in a direction from the outer canthus towards the cornea.

2. Blood extravasated between the periosteum and roof of the orbit may find its way into the eyelids. It then appears first beneath the skin of the upper eyelid, and subsequently follows exactly the same course, and gives rise to precisely the same appearances, as blood which has collected in the lids from a superficial contusion.

3. Hæmorrhage into the cellular tissue of the orbit appears first, and in quantity, beneath the ocular conjunctiva, and subsequently spreads to the eyelids. The appearance thus presented, occurring after an injury to the head, is highly characteristic of a fracture of the base of the skull.

4. Extravasation into the cellular tissue of the orbit is sometimes caused by crushing injuries of the abdomen and thorax. The blood is then seen beneath the conjunctiva and in the eyelids, presenting the same appearance as may result from fracture of the base of the skull.

It is often of some importance to be able to state the time that may be required for the absorption of a palpebral ecchymosis, and especially so when it is complicated with discoloration of the ocular conjunctiva, as this is usually regarded as an indication of something serious by the patient and his friends. The mode, also, in which absorption takes place presents some points of interest, a study of which will, I think, lead to a correct conclusion as to the kind of treatment likely to be attended with the greatest amount of success. Taking an ordinary case, where there is distension of both lids, and blood extending from the outer canthus beneath the conjunctiva to the cornea, it will be observed that the lids after a time assume a dull violet-red or purple tint, owing to partial oxidation of the extravasated blood having taken place through the thin skin. The puffiness gradually subsides, and a greenish stain appears around the margin of the orbit, and may extend some distance on to the cheek and nose. If now the upper eyelid be drawn down for inspection, there will be seen one or more transverse white lines crossing its discoloured surface. These lines are pressure marks, and correspond to the wrinkles formed when the lid is raised.

They illustrate the effect of pressure in hastening the removal of extravasated blood. As absorption proceeds the colour changes to greenish-brown, green, and lemon, in a manner similar to what is observed in ecchymoses elsewhere. The upper eyelid returns to its natural colour before the lower, and in each discoloration proceeds from above downwards, owing to the greatest quantity of blood having been collected by gravitation at the lowest points. The last trace of a palpebral ecchymosis is generally seen just above the inferior margin of the orbit. Meanwhile absorption has been going on in the blood beneath the conjunctiva. It does not here pass through the same changes of colour as in the lids or beneath the skin, but remains as a lake-red stain until its removal has been completed. This stain is usually at first triangular in shape, with the base directed outwards, but soon the pressure of the free margin of the lower lid divides it into two portions. The portion that is covered by the lower lid becomes rapidly absorbed, as does also any part of the stain overlapped by the upper lid, or pressed upon by the united lids external to the canthus. The stain thus becomes fashioned by the pressure of the lids during the time that the eyes remain open, and its outline in this way becomes reversed, so that it next appears as a smaller triangle, with a base corresponding to the outer margin of the cornea, and an apex at the outer canthus. Absorption now proceeds from without inwards, until at the end of three weeks all that remains is an insignificant speck, which formed part of the base of the triangle, and this is the last to become absorbed, owing to the projection of the cornea having served to protect it from the pressure of the eyelids. If, as commonly happens when a vessel has given way within the orbit, the whole or greater part of the conjunctiva be separated from the eyeball by the extravasated blood, absorption proceeds in the same way and is determined by the same causes. First that portion becomes absorbed which is continually pressed upon by the eyelids, and a transversely elliptical stain is left, enclosing the cornea. The portion internal to the cornea takes so completely the impression of the margins of the lids that it becomes notched above and below by the pressure of the lachrymal papillæ. Its further removal proceeds from within outwards, whilst the absorption of the portion external to the cornea is proceeding from without inwards, so that the remnants of the

extravasation last to disappear are two small specks, one on either side of the cornea. A faint yellow stain remains for a very short time at these points after the red colour has faded.

The time required for the absorption of a sub-conjunctival ecchymosis must necessarily vary with the amount of blood effused. It will also be found to depend to some extent upon the size of the palpebral fissure and the closeness with which the eyelids are applied to the eyes, the absorption being relatively quicker in those cases in which the lids fit accurately to the surface of the eyeball than when, as often happens, there is on either side of the eye a considerable interval between it and the lids. The average duration in a number of cases that I have noted was from twenty-one to twenty-five days. The most rapid absorption that I have observed was complete on the tenth day after the injury. This occurred in a healthy man, about thirty years of age, who had rather small eyes and very accurately fitting eyelids. On the other hand, I have seen several cases, like the one quoted, in which the whole of the blood was not completely absorbed at the end of a calendar month. When the sub-conjunctival ecchymosis is associated with palpebral resulting from a superficial injury, absorption of the blood in the lids is completed in about the same time as that in the conjunctiva; but when ecchymosis of the palpebræ is found to accompany sub-conjunctival effusion due to rupture of a vessel within the orbit, the blood contained in the eyelids is generally small in quantity, and absorbed before that beneath the conjunctiva.

In conclusion, I will add a word or two upon the treatment of simple palpebral ecchymosis, which, on account of the inconvenient disfigurement it causes, is not entirely beneath our notice. There are two indications—first, to check the outflow of blood from the vessels; and, secondly, to hasten the absorption of that which has escaped. To carry out the former the application of ice will be found of the greatest service, or, failing this, some evaporating lotion may be applied. If any converse experiment were needed in support of this treatment, it was furnished by a woman who presented herself among the out-patients last summer, suffering from such a swelling of the left eyelids as would hardly have been deemed possible. She stated that, after receiving a blow upon the left eye, she had, in order

to prevent inflammation, applied hot poultices, and was surprised to find that under this treatment the swelling had increased. But as she appeared at the police court on the day following, to claim damages for an assault, I am inclined to think that she might not have been altogether ignorant of the possible effects of her poultices. To accelerate the removal of the extravasated blood there are two reputed remedies, Arnica and Tamus Communis. These I have both tried and seen tried without being able to persuade myself that either shortened the duration of the ecchymosis. When describing the mode in which absorption takes place, I pointed out that the blood first disappears from those parts which are subjected to the greatest pressure, and last remains where most protected. From this it may be deduced that we have in pressure a valuable agent for promoting the absorption of extravasated blood; and I believe that the time usually required for the removal of a palpebral ecchymosis may be materially shortened by a carefully applied pad and bandage. Pressure was recommended many years ago by Velpeau in these cases, and I will close my paper by a passage from his thesis, in which he testifies to the efficacy of the treatment suggested:—"Chez un homme dont les paupières avaient ainsi acquis une épaisseur vraiment énorme, un bandage compressif méthodiquement appliqué, produisit un dégorgement si rapide, que les élèves de l'hôpital osaient à peine en croire leurs yeux."¹

¹ Op. cit.

MEDICO-LEGAL OBSERVATIONS
ON TATTOO-MARKS AS EVIDENCE OF
PERSONAL IDENTITY.

REMARKS ON THE TICHBORNE CASE.

BY ALFRED S. TAYLOR, M.D., F.R.S.

THE subject of tattooing in its relation to medical jurisprudence has of late years received some attention from French and German writers. Certain cases have recently occurred in France and Germany which have shown the great importance of a knowledge of the facts connected with tattooing, in cases of contested personal identity; and the law courts of England have, during the last three years, been occupied with a trial in which some of the issues turn upon the nature and durability of these artificial marks.

The presence of tattooed or coloured marks on the skin of a person, verified by a competent observer, may become the strongest possible proof of identity, and their proved absence, if not accounted for or reasonably explained, may furnish the most convincing evidence of non-identity. An escaped convict may allege that he never was tattooed. There may be no coloured marks on his skin, but a medical expert may still be able to demonstrate that there have been such marks, and that traces of them still exist. A man who is found to be tattooed may, in order to escape punishment, pass himself off as another person also tattooed. In this case medical evidence must be derived from a comparison of the colour, form, and situation of the marks in the two. A tattooed

man may claim an estate, and adduce the tattoo-marks as a proof of his identity. It would be difficult for an impostor setting up a false claim to simulate marks of this kind. The operation would require time and an accurate imitation of the colour and design, and the impostor must take care to select precisely the same part of the body for the purpose of tattooing. These conditions present insuperable difficulties to the success of such an experiment. Members of the family would be able to say whether the marks were or were not such as those which had existed on their missing relative. On the other hand, there may be satisfactory proof that the missing person was tattooed, while the impostor may allege that he had not been tattooed. The fact, however, may be that at some former period of his life he had undergone this operation, and in order to prevent discovery of the fraud he had removed the marks by cautery or other means. The presence of tattoo-marks, and their correspondence in situation, colour, and design with those which could be proved to have existed on a missing person, would furnish the possible evidence of identity. Indeed it is difficult to understand how any other evidence could be required. In the late Tichborne case the Chief Justice Cockburn described this species of evidence as of "vital importance," and in itself final and conclusive.

Mode and date of production.—Tattoo-marks are the result of minute punctured wounds, made deeply in the true skin with three or four sharp needles closely bound together, and charged with some kind of colouring matter. The parts of the body generally selected for the operation, are commonly the arms and backs of the hands, the front of the chest and abdomen. The skin of the parts selected for the tattooing process, is made tense by pressure, and the needles dipped in the colouring matter, are then plunged fully into the cutis or true skin. A fresh dipping takes place for each set of punctures, and, finally, in some cases a portion of the colouring matter is rubbed over the punctures. When the colouring matter is quite insoluble, as the charcoal of gunpowder or vermilion, the most effectual way of introducing it would be by rubbing in the colour mixed with a little water; but the needles are found to carry with them sufficient colouring matter if too much water is not used. A design is first sketched on the surface

of the skin, and the needles follow this design. There is, however, a difference in using them. In some instances they are plunged in vertically, and in others obliquely, so as to form valvular or oblique punctures. Judging by the results, the latter appears to be the most efficient plan for the introduction of the colour and its permanent retention by the skin. When the substance of the cutis has been penetrated, as it ought to be to leave permanent marks, there is at first bleeding, which is slight, and after a few hours swelling of the skin, with general inflammation. In most cases this passes off in a few days; there is a general cicatrization of the small punctures, and, according to some, very little pain or inconvenience is suffered at any time. M. Berchon states as the result of his observations, that the local symptoms of irritation and inflammation have lasted about a fortnight. At the end of the first month the lines of colour appear wider than they are likely to be ultimately. About the sixth week the cuticle begins to scale off, and at the end of two months, or a somewhat longer period, the skin acquires its normal condition. The designs in vermilion have been observed at this early time to be much more intense than those produced by China ink. When the local symptoms have subsided, the latter marks are fixed permanently, and it is impossible to assign a date to them, as they undergo no further change.

The colours commonly employed in tattooing are charcoal (gunpowder), China ink, vermilion, and indigo. Other vegetable colouring matters of a fugitive kind are sometimes used. China ink and charcoal, although black, produce designs on a white skin which have a bluish tint. It will be easily understood that when the tattooer employs a soluble colour like China ink, which consists of finely levigated carbon and gelatin, the intensity of the marks as seen subsequently will depend on the strength of the pigment, or the quantity of water with which it is mixed, and thus the design may ultimately be of a pale blue colour or almost black. I have seen these varieties of shade on the same skin in cases in which the designs had been produced with China ink at different times. This difference in the strength of the colour may account for the alleged fading of some of these marks. The colouring matter thus deposited mechanically in these

minute punctured wounds, after the first attack of inflammation has passed off, remains permanently encysted in the substance of the cutis or true skin and in the cellular membrane below it. It has been there found after death.

Durability of the marks. Alleged spontaneous disappearance.—In imperfect cases of tattooing, when soluble colours much diluted have been used and the surface of the cutis only is penetrated, the marks may disappear or be removed by artificial means. Not so when the colouring matter is carried completely into the substance of the cutis or true skin. It there forms an intimate combination with the fibrous structure of the skin, and remains permanently fixed. M. Rayer has shown by the maceration of tattooed skin that the cuticle may be removed, and it is quite colourless, as in ordinary skin. This, therefore, proves that the colouring matter is firmly imbedded in the cutis and cellular tissue below it. ('*Annales d'Hygiène*,' 1855, vol. i, p. 194.) A maceration of the skin in water for two months did not affect the colour of the tattoo-marks, and M. Tardieu found that no solvent could remove the colouring matter without at the same time destroying the texture of the skin.

In most anatomical Museums, preparations of tattooed skin may be seen. In Guy's Hospital Museum there are five. The designs have been produced with gunpowder, and some small portions with vermilion. In one of them, which has been preserved in spirit for forty years, the marks on the skin of the leg represent an animal like a goat; they are of a bluish-black colour. In the part from which the cuticle has been removed the colour appears much more intense. There is nothing to indicate that this preparation has undergone the slightest change of colour during its long maceration in spirit. This and the other preparations also show that no colour is removed by removing the cuticle; on the contrary, the colour becomes brighter and more intense by contrast with the white surface of the cutis. Another preparation of the skin of the arm represents in blue-black (carbon) and red (vermilion) the crucifixion, with the date Nantes, 1808. In this also the cuticle has been removed in part, with the effect of bringing out the colours more strongly. Sixty-five years have passed since these marks were produced, but neither while living nor in undergoing maceration in water and spirits after death is there any appearance of

change in the depth of colour or in the outlines of the design. In a third, the skin was taken from the arm of a sailor who died in Guy's Hospital in 1857. The designs represent the arms of England, and Adam and Eve with the tree of life and the serpent. It has been noticed with regard to this preparation that the red or vermilion colour has become less marked during the sixteen years that it has been in the museum. Another preparation of the skin from over the scapula has simply a large letter D, the brand of a deserter. This was removed from a dead body in 1860. The fifth, of the date of about ten years, represents, in a very perfect manner, a ship in full sail, with the figure of a woman. This has a date of ten years; the skin was taken from the chest of a sailor. These facts show how durable the carbonaceous colours are when they have once penetrated the cutis. No amount of maceration appears in any way to affect or alter them.

A surveyor accidentally punctured the skin of the back of his hand with a sharp steel pen charged with China ink. A bluish-black spot was formed after the healing of the wound; this was quite visible and unchanged when I saw the hand after six years, and it would, no doubt, continue for life. A near relative of my own was tattooed with China ink on the inside of the arm. The designs, which were of a bluish colour, remained within my observation unchanged up to his death, and for the long period of twenty-eight years.

There is at the present time (February, 1874) a patient in Guy's Hospital whose case well illustrates the permanency of these tattoo-marks when once effectually produced. This man, set. 50, has been a sailor, and, while in the China seas, from 1842 to 1847, he underwent the process of tattooing at different times. There are numerous designs on the skin of both arms; and on the front of his chest, some of them artistically finished, representing flowers and leaves, the figure of Britannia and other figures. He states that the tattooing was performed by English sailors, that three needles bound together were employed, and that the punctures were made sideways or obliquely. Two colours were used, China ink and vermilion. The designs in China ink are of a bluish colour, one on the back of the hand, representing a flower-pot, being almost black. The vermilion was used to represent flowers, and the red colour

is very apparent. This man states that the designs have not changed in appearance or faded in any way since they were first produced. The drawing on the back of the right hand and a tattooed ring round one of the fingers have, of course, been freely exposed to light, air, friction, and washing with water; but the colours have not been in any way affected. This man had also been in the habit of using naphtha, but no change had been produced by this liquid. In this case the tattoo marks have remained unaltered from twenty-six to thirty-two years!¹

It is somewhat remarkable as a coincidence that on the left arm of this man there are three capital letters, R. C. T. These do not represent his own initials or those of the "Claimant," but certain nautical signs which he stated were common among sailors.

It has been rather hastily assumed that in a certain percentage, tattoo-marks spontaneously disappear in the course of time. Thus, M. Hutin examined 506 cases of tattooing. Relying upon the statements made by the soldiers, sailors, convicts, and others, his conclusion was that in 47 the marks were completely obliterated after a period of from twenty-eight to sixty years; 117 were partially obliterated after a period of from ten to sixty-four years; but in 342 the marks were quite distinct after a space of from four to sixty-five years! With the exception of two cases of tattooing in vermilion which disappeared after thirty years, M. Tardieu found that the disappearance of tattoo-marks did not take place until after thirty to forty years, and of the only two tattooings with China ink which were obliterated, one took place after forty-five and the other only after sixty years. Taking the united experience of MM. Casper, Hutin and Tardieu, in about nine per cent. of cases the colours spontaneously disappear; but in reference to black colours this can only be admitted with great reservation. The statistics on which this medical conclusion is based are

¹ The patient has given the following description of the method in which the operation was performed on him. Drawings were first made on the skin by a pencil without lead, but dipped in a strong solution of China ink. At the other end of the pencil were placed the needles used for penetrating the skin, which were also dipped in the China ink each time that they were used. The vermilion powder, mixed with a small quantity of water, was employed in precisely the same manner as the China ink. The powder was not rubbed into the punctures. The needles were made to penetrate the skin obliquely, following the outline of the drawing.

faulty in this respect—they rest upon the assumption that, apart from the effects of colour, all the tattooings have been done with equal care and skill, and that the colours have been always equally intense, and in all cases carried to the same depth in the cutis! There is reason to believe that the nine per cent. of cases represent only nine instances in one hundred in which the operation has been carelessly performed with weak colouring matter, deposited only in the superficial layers of the cutis. This is probably the true explanation of the occasional disappearance of such marks from the skin.

It must be admitted that in a few cases these marks may fade or become less visible, but this change requires a period of ten years at the least. The fading of the marks most probably arises, not from removal of the colouring matter by the absorbents, but from the fact that in some cases the tattooing has been superficially performed on a thick skin, with colours of a fugitive kind or too much diluted. If the absorbents can remove from the tattoo-marks such insoluble colours as carbon and vermilion, it would scarcely require a period of from ten to twenty-eight years for their removal, and on this theory it would be impossible to explain why tattoo-marks should remain permanent in any case.

As proofs of the removal of these marks by absorption, it is stated that the neighbouring absorbent glands have been found to contain the finely divided particles of colouring matter, *i.e.* vermilion or carbon (*'Annales d'Hygiène,'* 1870, vol. ii, p. 453). Dr. Horteloup attaches much importance to the removal of the colouring material by the absorbents, and he considers that in all cases where a post-mortem examination can be made, the neighbouring absorbent glands should be specially examined, and if no tattoo-colouring matter is contained in them, and there are no marks on the skin, it may be inferred that the deceased had not been tattooed during life. The colouring matter is here assumed to be retained by the glands after all traces have disappeared from the skin (*'Annales d'Hygiène,'* 1870, vol. ii, p. 455). Casper has given in his plates a coloured drawing of an axillary gland intensely reddened by red colouring matter (cinnabar) derived, as it is stated, from tattoo-marks on the chest of the deceased, a man, aged 60. The letters J. C. C. 1848 were quite legible on

the skin of the chest. On the borders of the gland the cinnabar was in large quantity, and had a sprinkled appearance. It is not stated, as confirmatory of this judgment from the eye, that a chemical analysis of the gland was made and mercury extracted.

This theory of absorption to explain the removal of insoluble powders like vermilion or charcoal is not satisfactory. It may apply to cases in which soluble colours have been used, and in which the coloured drawings have disappeared soon after their production; but it leaves unexplained why a pigment should remain unchanged in the skin for twenty or thirty years, and that the effects of absorption should then only begin to be manifested. In reference to Casper's case above mentioned, the neglect to examine the gland chemically, leaves it doubtful whether the colour depended on vermilion or on altered blood.¹

The nature of the colouring material appears to have some influence on the durability of the tattoo-marks. Thus, M. Hutin found that out of seventy-eight persons who had been tattooed with vermilion alone, the tattoo-marks had disappeared in eleven, and that out of 104 tattooed with black pigment, such as carbon, China ink, &c., not one had become obliterated. This permanency of the black pigment has also been noticed by other observers.

The general conclusion from these observations is that tattoo-marks once properly made in the cutis are practically indelible, that when the operation is imperfectly performed the marks may, in the course of years, become lighter and disappear.

¹ A writer in the 'Medical Times and Gazette,' December 11th, 1852, states that there is evidence that the absorbent glands in the neighbourhood of a tattoo-mark become filled with pigment. He says, "At the time of writing this report there is in the dissecting-rooms attached to St. Bartholomew's Hospital, the body of a native of one of the islands of the Eastern Archipelago, whose skin has been ornamented to an extent but rarely seen. The whole back, from the sacrum to the shoulder, is covered with circles, radiating stars, and feathers; the arms and the thighs are both marked, but the front of the body is comparatively clear. The absorbent glands in the groin and about the axilla were of deep black hue; those in the neck of the ordinary white colour. Mr. Coote, the demonstrator of anatomy, succeeded in dissecting out some absorbent vessels leading to the glands in the thigh, filled with black pigment in long streaks. These indications of the action of the absorbents were, however, few, and the tattoo-marks existed everywhere with as much clearness apparently as at the time when they were first made." It would in all cases be more satisfactory to separate the insoluble colouring matter, and not rely upon colour as an absolute proof of the presence of the pigments.

This is observed more frequently with red colouring matters than with the black or carbonaceous colours. As accurate information can seldom be obtained respecting the tattooing in early life, it may be inferred in a contested case in which the marks are proved to have disappeared, that the tattooing was imperfectly performed. This point, however, admits of refutation when it can be proved that the marks are still visible on the arm of another, tattooed at the same time, by the same person, and with similar materials.

Removal of tattoo-marks by art.—Many absurd statements have been made by convicts respecting the removal of tattoo-marks from their skins.¹ The only method by which such marks admit of removal are by excision of the cutis or the application of the actual cautery or caustic substances of sufficient power to destroy the true skin. In such cases cicatrices necessarily remain, which under a proper examination, may lead to detection.

A case occurred to M. Tardieu in which the fact of obliteration was the main question for solution. ('*Annales d'Hygiène*,' 1855, vol. i, 201.) A man named *Aubert* was charged with having committed a robbery in 1843. His defence was that he was at that date confined in a certain prison under the assumed name of *Solignon*. On searching the prison-register, it was found that a man named Solignon was there confined at the date assigned, and the description of the prisoner showed that he was tattooed on both arms,—on the left, there were two hearts, a dog, and other emblems; on the right a man, a woman, a dog, and two hearts. On examining the prisoner, Aubert, no marks of tattooing were seen upon his arms, although he affirmed that he had been tattooed by a friend in 1840, and again in 1846, with a blue vegetable ink, but that he had some months previously, removed the marks by a chemical process. He also described the marks; those on the right representing the bust of a woman and the letters J. S., and on the left a tomb, with foliage, &c. In 1846 a hunting scene had been added, but this was the faintest of all.

By close examination of the skin with a lens in a strong

¹ A convict in a foreign prison informed the medical officer, in answer to his inquiries, that he had succeeded in removing the marks from his skin by the application of a red herring!

light, M. Tardieu was able to detect faint white marks like cicatrices representing the outline of a tomb, with two hearts; and the marks indicative of two letters were also detected on the skin of the other arm by the same means. From these observations the non-identity of the accused Aubert with the former prisoner Solignon was clearly proved. Both were tattooed, but the tattoo-designs were quite different, and under less skilful hands than those of M. Tardieu, Aubert might have escaped the punishment which he merited.

The prisoner Aubert communicated to M. Tardieu the plan which he had adopted for removing the tattoo-marks. He first applied an ointment of strong acetic acid. He then used a weak solution of potash, and afterwards hydrochloric acid. The skin which had been removed by these caustics was gradually reproduced; but although the colouring material was removed, linear cicatrices were left in the skin in every part to which the tattooing needles had been applied. M. Tardieu subsequently tried this process on some tattoo-marks, and he found that the colouring matter might be thus removed, but that traces indicative of the original designs were still left in the skin.

Simple friction of the skin will sometimes suffice to bring out obliterated tattoo-marks. An escaped convict was on trial before a French Court, and the question turned upon his identity with a prisoner known to have been tattooed. There was no appearance of coloured marks upon his arm, and the question submitted to M. Leroy, who was consulted by the President of the Court, was—Whether the man had ever been tattooed? M. Leroy used strong friction to the skin of the arm. This had the effect of bringing out white lines as cicatrices with a slight bluish tint. By this means the word 'Sophie' was plainly legible in white marks on the reddened skin. This fixed the identity of the convict, who thereupon was disposed to knock down the witness. (*'Annales d'Hygiène,'* 1870, vol. ii, p. 460.) As perfect tattooing cannot take place without deeply wounding the cutis and causing a cicatrix, we must not trust to the absence of colour only when an opinion is required whether the person has or has not been tattooed. Strong friction of the skin may bring out evidence of the presence of minute cicatrices from punctures.

The observations above made apply equally to the destruction of tattoo-marks by fire. Dr. Horteloup examined the arm of a man, aged 42, who at the age of 18, had been tattooed with China ink. At the age of 30, a bar of iron at a white heat, accidentally dropped on the tattooed portion of his arm. Twelve years after this accident, Dr. Horteloup found a white cicatrix on the arm which had obliterated part of the design (a ship). When the obliterated portion was minutely examined with a lens, faint white lines were seen which filled up and completed the figure of a ship. ('*Annales d'Hygiène*,' 1870, vol. ii, p. 459).

M. Bois de Loury met with an instance which proves that it is very difficult to eradicate tattoo-marks without leaving distinct cicatrices of them. In this case a man had a number of initials of names spread over the skin of his chest and arms, and in many parts he had obliterated the letters by a red-hot iron applied to the skin,—but in every instance there was a well-defined cicatrix, and it was still possible in some to make out traces of the letters. ('*Annales d'Hygiène*,' 1872, vol. i, p. 423.)

Tattoo-marks on the dead.—When we are called upon to examine a dead body for marks of tattooing, great caution is required if no coloured marks are apparent on the skin. Putrefaction, unless very far advanced, does not interfere with their appearance. M. Tardieu states that in examining the partially decomposed body of a man who had been a carpenter, the tattoo-marks on his arm clearly represented the instruments of his trade. When the question is whether the marks have been on the arm and subsequently removed, there will be some difficulty. An examination of the skin with a lens in a strong light may show the presence of lines corresponding to cicatrices; but the evidence derivable from frictions of the skin, cannot be obtained in such cases. Dr. Horteloup recommends the examination of the neighbouring absorbent glands for the colouring matter; but if the marks are of many years' standing, colouring matter is not likely to be found in them; and no evidence of this should be received unless it was based on satisfactory chemical results. A case which occurred to the late Prof. Casper, of Berlin, is eminently instructive in this respect.

In 1849, the body of a man, decapitated, was found in the

neighbourhood of Berlin. It was supposed to be that of one *Gottlieb Ebermann*, who was missing. It was stated that the body of Ebermann could be identified by marks of cupping on the wrists, an operation performed on him eight or nine years before his death, and also by tattoo-marks of a heart and the letters G E on his left arm. On an examination of the body no marks of any kind could be perceived, and Ebermann's wife, who had been married to him two years, and his three sisters, affirmed that they had never seen any tattoo-marks on his skin. The body was exhumed after five months, but owing to putrefaction, no further evidence could be obtained from it. A man of the name of *Schall* had been in the meantime charged with the murder, and the circumstantial evidence was so strong against him, that nothing more was required than to prove that the body found was that of Ebermann. Of two medical experts who were called to give evidence, one deposed that the marks of cupping could always be distinguished, and that those of tattooing were indelible:—the other stated that the marks of cupping might spontaneously disappear, but with regard to the tattooing he could give no opinion. As this evidence failed to establish the identity of the body, the medical opinion of Prof. Casper as assessor was required by the Court.

In his report, taken from the observations made in a large asylum for aged and invalid soldiers, a class among whom tattoo-marks are common, he stated that out of thirty-six examples, in three the tattooing had become faint with time; in two, the marks were partially effaced; in four, they were completely obliterated; hence M. Casper came to the conclusion that the marks of tattooing can disappear. A witness came forward and declared, during the investigation, that at fifteen he had tattooed himself on the arm with cinnabar, and that the marks had become entirely effaced. The conclusion of the trial was, that Schall was condemned. (Casper's '*Vierteljahresschrift*,' 1852, vol. i, p. 274, and 1853, vol. i, p. 338.)

The singular part of this case is, that there was an entire absence of proof that the deceased had ever been tattooed; for the wife who had cohabited with the deceased for two years, and his three married sisters, had never seen the mark. Dr. Chereau, in '*L'Union Médicale*,' November 16, 1852, justly observes, respecting Casper's report in this case that it is not one which

should have been made the foundation of a judicial decision, for it is not stated at what age, with what substances, and in what manner, the tattoo-marks had been produced in the four instances in which there was complete obliteration. Were the men to be trusted? How many years had elapsed before the marks became effaced? What was the nature of the colouring matter used? Was it mineral or vegetable, and was it carried deeply into the cutis or only disposed on the surface? These questions should have received satisfactory answers before comparisons were made and important medical conclusions were based upon them. Casper's unqualified opinion that such marks, assuming them to have existed, might have spontaneously disappeared in the deceased, led to the conviction and execution of Schall! The accused confessed his crime before execution, but the position assumed by Casper on this occasion, is certainly not a precedent to be followed by medical jurists. In all cases in which an opinion is required of a medical man, —whether tattoo-marks have been effaced from the skin or not, there should be no doubt whatever touching their previous existence.

A question may arise in contested identity, whether any accidental or temporary marks made on the skin, can be mistaken for tattooing? This does not seem at all probable. The colour and the design might be imitated by water-colour pigments, but this would be only superficial, *i.e.* on the cuticle, and they would be readily removed by water. No professional man could be deceived by such an attempt at imposture.

It may be suggested that marks of tattooing said to have been seen by witnesses on the skin of a missing person, were caused by the application of coloured chalk or pencil. Such an objection to scientific evidence hardly needs serious refutation. Coloured marks could only be produced by very soft chalk, and would never have the depth, intensity or appearance of tattooing. They would be removed and obliterated by the slightest friction. The most superficial observer could not be deceived by them. Again, it may be alleged of a missing person, by one set of witnesses, that he was tattooed, and by another set that they had had casual opportunities of seeing his skin and did not observe any tattoo-marks. In such a case, the evidence given by near relatives, whose opportunities of observation are much more

frequent, is more reliable than that of persons who could have only seen the bare skin on some rare occasions, and could have had no particular reason at the time for observing its actual condition. This, of course, becomes simply a question of credibility and accuracy of observation.

Medical responsibility.—The process of tattooing is not unattended with danger. Cases are recorded in which syphilis has been thus transmitted by inoculation. ('*Annales d'Hygiène*,' 1855, vol. i, p. 175.) M. Berchon has collected four cases in which the operation proved fatal by reason of the after consequences. ('*Annales d'Hygiène*,' 1870, vol. ii, p. 464.) This author advises that the practice should be stopped by legislation. He holds that tattooing should be treated as unlawful wounding. As the operation is not usually performed by medical men, no responsibility can be incurred by them. The operators are commonly sailors who have acquired some practice in the art. The act is voluntary on the part of the person tattooed, and there is nothing in the results, at least in this country, to justify legal interference.

A medical man may be consulted about the removal of these marks, and when he has tried experiments on this subject, he will be able to appreciate the view generally entertained of their indelibility, at least so far as the carbon-marks are concerned. A few years since I was consulted in the following case:—By an accidental discharge of gunpowder a portion was blown into the face of a young man. After recovery from the first effects, a bluish tint was left on the lower part of the forehead, the nose, and the upper part of the cheeks and eyelids. He had consulted several physicians and surgeons, and under their advice, had employed various local applications for the removal of the marks, but without result. I saw him a year after the accident. On examining the discoloured parts with a magnifying glass, it was obvious that the small particles of carbon were deeply and firmly embedded in the skin. Local applications to promote absorption were tried, but it was quite evident that nothing but the entire destruction of the cutis would remove the marks. Blistering could have no effect, as this would only remove the cuticle.

Medico-legal questions connected with the presence or absence of tattoo-marks on the skin, have been hitherto confined to

proof or disproof of the identity of persons charged with crime. If it is alleged that they have existed and disappeared by time or artificial means, medical evidence may be required to show how far this is probable. In the Tichborne case (*Tichborne v. Lushington*, C. P. 1871-2, and *Reg. v. Castro or Tichborne* August 1873 to February 1874), certain medico-legal questions were raised in reference to identity derivable from tattoo-marks, and the possibility of removing them by the actual cautery, or by chemical substances.

This case which, in the form of a second trial, has occupied three learned judges for the greater part of a year, is quite exceptional, not only in its duration, but in the number of witnesses examined on both sides, as well as in the complexity and the conflicting nature of the evidence given for and against the identity of the defendant. In this place the case can be noticed only in reference to the medical evidence derivable from the presence or absence of tattoo-marks, and of certain scars or cicatrices in the skin.

The details of the Tichborne case have been so fully given in the public journals during the last three years, that it will not be necessary to do more than make a general reference to the facts connected with the *medical* proofs of personal identity. A man calling himself Sir Roger Charles Tichborne claimed certain estates, as being the son and heir of Sir James Doughty Tichborne. This man, now proved to be an impostor, came from Australia about six years since, and applied to the Court of Chancery as a first step in asserting his alleged rights. After a trial of ejectment in the Common Pleas, extending over one hundred and three days, in which he was nonsuited, he was committed on numerous charges of perjury in his affidavit in Chancery and in his examination in Court. After a second trial of the unexampled duration of one hundred and eighty-eight days, he was found guilty of perjury and sentenced to penal servitude. By the unanimous verdict of the jury, and the full concurrence of the Court, he was pronounced to be Arthur Orton, the son of a butcher at Wapping.

It appeared from the evidence that the Claimant was of about the same stature, but younger than the missing Roger Tichborne, and it is probable that there were some marks of resemblance between them in personal appearance. These points of

resemblance, however slight, may have sufficed to deceive some of the witnesses who gave evidence, *bonâ fide*, in favour of his claim, and who had had only a passing or superficial acquaintance with Roger Tichborne many years ago. There was a difference in the colour of the hair, in the voice, and in the form of the ears; but the most remarkable personal difference was in size. Roger Tichborne, when last seen, was about twenty-five years of age, thin and slender; the man putting forth this claim was enormously fat, but it was suggested that the lapse of twelve or thirteen years might account for this difference. There was a great conflict of evidence on the question of identity, chiefly arising from the long period which had elapsed before this claim to the estates was made.

Roger Tichborne sailed from Rio in the *Bella*, in April, 1854, with the intention of going to New York. On the 4th May, three weeks after he had set sail, the intelligence reached Rio that the *Bella* had been lost at sea, and that all on board, including Roger, had perished. Up to this date he had been a good correspondent, writing frequently to several members of his family, and giving a full account of his travels and adventures. But from the date of the sailing of the *Bella*, no letter had ever been received from him. Then, again, no one who had sailed in that ship, had ever been seen or heard of afterwards. The insurances on vessel and cargo were paid as for a total loss. The next heir took the Tichborne estates: the will of Roger was proved, and his testamentary dispositions had been carried out.

Twelve years had passed away, when about the year 1866 the claimant Orton, who was residing in Australia, first announced himself as Roger Tichborne, and stated that he had been saved from the wreck of the *Bella* in 1854.

Lady Tichborne, the mother of Roger, had from an early period taken up an idea which became fixed in her mind, that her son had been saved by some passing vessel and carried into a foreign port. She caused advertisements to be inserted in the London and Australian journals, describing the personal appearance of Roger, his age, the date of his supposed loss in the *Bella*, and numerous other particulars by which he might be identified, but of which a fraudulent use was subsequently

made. She also promised a reward for any information respecting her lost son. It was a significant fact in this case that the claim made to the Tichborne estates by the defendant Orton, was not put forward until after these advertisements had appeared in the Australian and other journals.

At the first trial in the Common Pleas (*Tichborne v. Lushington*, 1871) the Claimant failed to prove that he was the man he represented himself to be, and on the second trial, on a criminal indictment for perjury, it devolved upon the Crown to show that he was not the missing Roger. For this purpose a vast amount of evidence was taken, and a host of witnesses were examined on the part of the prosecution and defence, the trial extending over a period of nine months. With the exception of Lady Tichborne, who was prepared to recognize the Claimant as her son before she had even seen him, and whose ultimate recognition of him was not such as would have satisfied any reasonable mind, all the members of the family and many of the most intimate friends and companions of Roger denounced the man as an impostor.

The early teachers of Roger, the companions of his youth, and his fellow-officers in the army, also affirmed that the Claimant was not Roger Tichborne, although a few among them thought there was a resemblance in some respects. On the other side a large number of witnesses, called for the defendant, swore positively to his identity with the missing Roger.

The events of Roger's boyhood, his scholastic life, his military career, his travels in South America, his handwriting, and style of correspondence, were made subjects of minute inquiry and comparison.

On all these matters the defendant underwent a rigorous examination. He had travelled in South America, nearly over the same parts which had been visited by Roger, and he had obtained a general knowledge of Roger's habits and associates; but he betrayed complete ignorance of some of the most important events of Roger's life, and in reference to education he had no knowledge of subjects which Roger had been known to acquire.

On all these points there was a strong balance of evidence to show that the defendant could not be Roger Tichborne; and if any doubt remained, the medical evidence in reference to tattoo-marks and scars was sufficient to remove it.

It is difficult to understand why this part of the evidence was not fully gone into at an early stage of the first trial. Probably its importance was not then sufficiently appreciated. It was thought better to submit to the jury a comparison of the personal characters, the education, and the social habits of the two persons, asserted to be one and the same, than to trust to the proofs of physical differences between them; but if the witnesses were to be believed, physical differences were alone sufficient to show that the Claimant could not by any possibility be Roger Tichborne. If a missing heir to an estate is satisfactorily proved to have had only one arm, and twelve years afterwards a claimant with two arms makes his appearance, and boldly affirms that he had never lost an arm, would it be necessary to go into a comparison of moral character, education, and social habits? So if a missing heir is proved to have been tattooed, and the Claimant not only has no marks of tattooing upon his person, but swears repeatedly that he never was tattooed, this is surely sufficient to prove non-identity. As the Lord Chief Justice observed in his summing-up at the second trial, such evidence must be regarded as "final and conclusive." "The defendant, it is admitted, has no marks of tattooing about him,¹ and he has sworn positively that he never was tattooed If Roger Tichborne was tattooed, then the defendant cannot be Roger Tichborne." The issue, therefore, medically speaking, was of the most simple kind; but it was rendered complex by the fact that this trial really involved a case of double identity. It was considered necessary to prove not only that the defendant was not Roger Tichborne, but that he was really Arthur Orton.

The evidence given at both trials brought out the following facts:—Roger Tichborne, up to the time of his departure from England in 1852, had upon the inside of his left forearm certain tattoo-marks of a blue colour, representing a cross, a heart, and an anchor—the symbols of Faith, Hope, and Charity. The

¹ Dr. Lipcombe, his physician, gave evidence to this effect at the first trial. Had the defendant had any reliance upon the truthfulness of his case, this gentleman ought to have been called by him as a witness at the second trial. By a legal artifice he appears to have been kept back, obviously because his evidence as a truthful witness would have damaged the case for the defendant, not merely in reference to the tattooing, but in reference to the absence of certain cicatrices which were known to have existed on the person of Roger Tichborne!

late Lady Doughty deposed that she had first seen these marks in 1846, and repeatedly after that date up to the time when Roger left England, *i. e.* over a period of six years. Roger informed her that they had been done by a sailor in Brittany, on the coast of France. At this date they were also seen by a boy-friend, Reginald Talbot, who passed his vacations with Roger in 1846-7.

Lord Bellew, who was at Stonyhurst with Roger Tichborne in 1847-8, deposed that while there, he himself tattooed the left arm of Roger. He observed on his arm at this time a heart, a cross, and an anchor. Witness tattooed the letters R. C. T. on the inside of the left arm near to the wrist. The letters were made with Indian ink, and three needles fixed in a handle were used. Witness saw these marks up to the time Roger left Stonyhurst in 1848. On the same day that he tattooed Roger's arm, Roger tattooed an anchor on witness's arm. (The witness showed his arm, with the tattoo-marks upon it, to the jury.) It was most probable, the witness said, that the anchor shown was done in the same hour that Roger's tattooing was done, but certainly it was done with the same ink and needles. In answer to the judge, witness stated that the marks on his arm had not been renewed since they were first done. They had not been tattooed since. The letters R. C. T. on Roger Tichborne's arm were half an inch in length. It was about 1851 or 1852 that he saw Roger Tichborne last.

Lady Radcliffe, a cousin of Roger's, deposed that she saw these marks distinctly on several occasions from 1849 to the end of 1851, or the beginning of 1852. On the last occasion Roger showed the marks to her and other friends. One of these, Miss Weld, was called and corroborated this evidence. Several other friends and relations, including Lady Dormer and Mrs. Nangle, gave confirmatory evidence, and said that Roger used to show the tattooing constantly, and made no secret of it. A game-keeper, two persons from Stonyhurst, and some of his brother officers, also deposed to having most distinctly seen these marks on Roger's arm so as to leave in their minds no doubt of their existence. They were seen by these witnesses at different times between 1850 and 1852, the year in which Roger left England. M. Chatillon, the French tutor of Roger, and his wife, saw these blue marks upon his arm when Roger was in Paris, and

both described them as representing a cross, an anchor, and a heart. M. Chatillon saw them last in 1852, shortly before Roger's departure from England.

There could be no reason to doubt the truth of this mass of evidence. The facts deposed to were so clear and the observations so numerous, as to remove the matter entirely from medical speculation and the applied wisdom of scientific experts as to the spontaneous disappearance of such marks. Roger Tichborne's arm was tattooed by a French sailor in 1846 and by his schoolfellow at Stonyhurst, Lord Bellew, in 1847-8. It was not in question whether the tattoo-marks had been artificially removed from the arm of the claimant. The Claimant repeatedly denied on oath, in his cross-examination, that he had ever been tattooed, and his physician, Dr. Lipscombe, who began to attend him in 1867, deposed at the first trial, that there were no such marks upon his body. The scars about him were minutely examined by surgical experts, and there were no cicatrices to indicate that any such tattoo-marks as those which were on Roger Tichborne's left arm, had been removed by cautery or otherwise from the arm of the plaintiff. To this part of the case for the defendants there was really no reasonable answer. It so happened that the tattooer had been himself tattooed at the same time, and was able to show in 1871-2 the marks produced on his own arm in 1847-8. The question of their spontaneous disappearance could not therefore be entertained. The colouring material used was the same in both cases, and was that which has been proved to be the most durable and not likely to fade, namely, China ink.

It will be perceived that the evidence regarding the durability of the tattooing was of the strongest possible kind. The cross, anchor, and heart were produced when Roger was in his seventeenth year, and about a year afterwards the three initial letters were tattooed on his arm. A number of witnesses had seen them at different times over a period of six years.

To assume, in the face of this evidence, that the Claimant was really the Roger Tichborne who left England in 1852, would require the admission that he had been tattooed on two different occasions in France and England, that he knew nothing of it, or had forgotten all about it! Further, it would have to be assumed that the tattooed marks on his arm had entirely disappeared in twenty years, without his knowledge and without

leaving any traces of their past existence; while the tattoo-marks made in the arm of another, at the same time and with the same materials, remained visible so as to supply conclusive evidence on the second trial in 1873.

What answer was there to this part of the case for the Crown? Literally none. The usual attempts were made to raise a conflict of evidence by bringing forward a large number of witnesses to swear that they had not seen or not observed these marks, although they had had opportunities of seeing Roger on one or more occasions with his arms bare or exposed. From the number of witnesses called to supply this negative evidence, it would seem as if the defendant's counsel wished to reverse the legal adage, *Testimonia non sunt ponderanda sed numeranda*. But this conflict of evidence was thus dealt with by the learned judge in his address to the jury:—"You must judge whether those to whom the arm was exhibited for the express purpose of showing the tattoo-marks are more likely to be right in saying they had seen them, than those who, having also had an opportunity, though not so good an one, of seeing them, say they did not observe the marks." It is quite clear on which side the balance of evidence lay. Without imputing *mala fides* to the defendant's witnesses, they may really not have seen the marks, because they had at the time no particular occasion to observe them, or they may have had a superficial view of them and thought no more of the matter. After the lapse of twenty years such slight impressions as were then made, would fade from the mind. Not one of these witnesses went so far as to state that Roger deliberately bared his arm and desired the witness to see for himself that there were *no* tattoo-marks upon it! But this ocular evidence in the affirmative was most clearly and distinctly given by several witnesses on the other side, the truth of whose testimony cannot be reasonably doubted. The fact of the positive existence of these marks was substantially reiterated by the late Lady Doughty in the dying deposition made on her death-bed before the second trial.

Finding that he could not get rid of these tattoo-marks, or damage the credibility of the witnesses who deposed to having seen them, the counsel for the defendant took up a theory on which I have elsewhere made some remarks (*ante*, p. 453). He asked the jury to believe that the tattoo-marks, which had been

seen by a number of witnesses in different places and under a variety of circumstances over six years, were not in, but *on* the skin; that they were pictorial drawings made by Roger to surprise or annoy those to whom he showed them! Counsel suggested that they might have been temporarily produced by the use of a coloured pencil, chalk, or paint. This was assuming that Roger always drew the same figures—a cross, an anchor, and a heart, &c., on the same part of his arm, and further, when taken by surprise, as where the marks were seen by a brother officer, who entered his bed-room one morning while he was dressing, that he had painted his arm in going to bed the night before! Such a theory is puerile, and inconsistent with all the evidence given in the case. It carries with it its own refutation.

It has been stated that the defendant, Arthur Orton, was not tattooed. An exception must be made to this statement. There were certainly no marks such as were proved to exist on Roger Tichborne, and nothing to show that they had ever existed on his skin. There was, however, a deep cicatrix or scar on the wrist of the defendant's left arm, of about the size of a shilling. There was evidence that when, as a youth, he was passing his time in Chili, the initials A. O. were seen as a tattoo-mark on this part of his skin. They no longer existed, and it was rendered probable, from the appearance of the cicatrix, that a portion of skin had been here removed by cautery or some corrosive substance, so as to obliterate the letters.¹

The verdict of the jury was fully justified by the medical evidence on the tattooing alone. There could be no doubt that the defendant must be an impostor, so soon as the evidence had clearly established that the missing heir had been tattooed and the defendant presented no marks of the kind on his person. There was nothing to shake the credibility of this evidence, or to cast a doubt upon the truth of the facts deposed to. With a boldness indicative of a lost cause, the counsel for the defendant asserted that he would scatter the tattoo evidence to the winds! But it proved too strong to be overthrown by his forensic ingenuity.

¹ When asked to explain the matter, the defendant could give no account of the cause of this cicatrix. One of his witnesses swore that he had produced it with the thrust of a stick; but its appearance was not consistent with this statement. *In re lupanari testes lupanares.*

Tattoo-marks have been justly considered to furnish a crucial test in cases of personal identity. This is no doubt true. In the case of an ordinary convict who alleges that he has been mistaken for some other person, a reference to this kind of evidence, when it can be obtained, speedily determines the question of identity or non-identity. In the Tichborne case there was really no answer to the tattooing evidence. By some persons it was treated as an afterthought, by others as an invention based on perjury; if the former, the facts would still remain unaltered, and the conclusion be the same; if the latter, it would be equal to rejecting the evidence of a large number of credible witnesses on a matter in which they all agreed, and in which they could have no possible interest to misrepresent the facts.

Perjury and forgery may, we know, be so perpetrated as to be exceedingly difficult of detection. The Tichborne case has proved the truth of this statement with respect to the Claimant and more than one of his witnesses. Thus, while the Wagga-Wagga impostor might swear on an affidavit that he was the heir to the Tichborne estates, and execute a will by forging the name of Roger Tichborne, he could not imitate the tattoo-marks which were proved to have existed on the skin of the real man. Even if he had made the attempt he would have failed from his ignorance of the form, colour, situation and arrangement of the marks. The fact is, that he and his informants knew nothing about the tattooing, and, therefore, when the subject was brought forward, his only course was to deny that he (as Roger) had ever been tattooed. By this denial, however, he clearly proved that he could not be the person whom he represented himself to be.

There were other medical facts connected with this case, such as scars or cicatrices on the person of Roger which did not exist on the defendant. It was proved that attempts had been made to bleed Roger in the arms, in the feet, and in the temporal artery shortly before he left England, and it was properly inferred, as the veins were opened by a medical man, that cicatrices would have been left in the skin covering these vessels. The witnesses for the Crown, Mr. Holt and Mr. Haden, and the chief witness for the defendant, Sir W. Fergusson, agreed that there were no scars or cicatrices on the arms, temple, or feet of

this man, to indicate that he had ever been bled. There were some cicatrices on the feet near the ankles, but these would not fit into the theory that they had resulted from incisions made with a lancet for the *bond fide* purpose of bleeding in the saphena vein. They had probably arisen from accidental wounds received by defendant at some period of his roving life in Australia. They established nothing in favour of his identity, but, on the contrary, served to prove that he could not be the missing man. Had they been over or near to the saphena vein the bleeding from the feet might have accounted for them; but as it was, the defendant's witnesses were obliged to admit that the scars had not been thus produced, but they were such as might have resulted from some accident to the feet, irrespective of bleeding. All agreed that they were of old date, but the accident causing them might also have been of old date. It was not the date, but the peculiar mode of production, which had to be proved, and in this the defendant utterly failed by the evidence of his own witnesses.

There was an additional medical fact deserving of notice. It was proved that Roger Tichborne when a boy had had an issue in his arm for two years, and when this was removed and the part healed, it left a deep cicatrix. The defendant had undergone repeated examinations by medical men, but no such mark or scar as an issue would leave, was found upon either arm. There were two marks on his shoulder which, in the opinion of the medical witnesses, were not such as a seton would have produced, although, according to the Claimant, a seton, and not an issue, had been placed in his shoulder about the year 1845. This, however, was a minor point, since Roger Tichborne had never had a seton applied. There was distinct evidence, however, that an issue had been put into Roger's arm in 1838, and the large single depressed cicatrix which it left in the shoulder was seen in 1849, *i.e.*, nine years after the removal of the issue. Could this cicatrix, which had thus existed nine years, have subsequently disappeared altogether? Either this must be admitted or the Claimant was not Roger.

The evidence respecting the scars simply corroborated that which was derived from the tattooing; and if all the other evidence respecting the life and habits of Roger Tichborne and Arthur Orton had been rejected, there would have been suffi-

cient in this branch of medical evidence to justify the jury in their finding that the defendant was not and could not be Roger Tichborne.

That this impostor should for so long a period have defied the law and deluded a large number of persons is in itself surprising. Are we to admit, as it has been suggested, that there are large classes of persons in this country, educated and uneducated, who are capable of any amount of delusion? We must either make this admission, or believe that they are ready to form a judgment in entire and wilful ignorance of facts. In either case there is real ground for humiliation. It points, as a public writer suggests, to a deficiency of common sense, and "the imperfect education of a large proportion of the English people. If one thing more than another is and ought to be the object of training in schools, in colleges, and daily life, it should be to enable a man of full years, and in the possession of ordinary faculties, to know what to believe and what to disbelieve, to discriminate the value and the weight of evidence, to reject the false and detect the true."

DEATH FROM DISEASE OR POISON.

DOES THE RETENTION OR MAINTENANCE OF HEAT
IN A DEAD BODY FURNISH ANY INDICATION
OF THE CAUSE OF DEATH?

By ALFRED S. TAYLOR, M.D., F.R.S.

THE recent death of a lady of the name of Gulliver at West Haddon, in Northamptonshire, led to a coroner's inquest, and a verdict to the effect "that the deceased *did not die a natural death—that her death was caused by poison*, but by whom administered there was not sufficient evidence to determine." Assuming that poison had been really administered in this case, the verdict of the jury reflected upon a niece of the deceased, a Mrs. Waters, the wife of a medical practitioner in Worcestershire. It appears that this lady had attended on the deceased during the last two days of her life, that she had given to her the food and medicine which she required, and was alone with her when she died. From some rumours that the deceased had been poisoned, the body was exhumed and examined about a month after death. The shock produced on Mrs. Waters by this inquiry, and the belief that she would be charged with the murder of her aunt, led her to destroy herself by poison. While the inquiry was pending, she took a fatal dose of strychnia, and died in a short time under the usual tetanic symptoms. When informed of the chemical evidence given at the inquest, she said, "I never gave her anything, of that I am

sure." It was rumoured that Mrs. Waters and her husband had some pecuniary interest beyond other relatives, in the death of Mrs. Gulliver, and this was supposed to supply a sufficient motive for the alleged murder.¹

In this case the theory of death from poison was not based on any medical facts, but on medical opinion, and on some non-medical circumstances which were supposed to be indicative of guilt.

It appeared from the evidence given at the inquest, that Mrs. Waters came by invitation on a visit to the deceased on Thursday, November 20th 1873, and remained with her until she died suddenly on the morning of Sunday November 23rd. Mrs. Gulliver is described as a woman, aged 73, of spare habit. She was in her usual health on the Thursday, but complained of a fluttering of the heart, which made her feel faint. According to one account she was subject to attacks of faintness, and this was rendered highly probable by the condition in which her heart was found after death.

On Friday, the 21st, she had a bilious attack attended with vomiting, and this produced, as it naturally would in a woman of her age, much exhaustion. She was seen by Mr. Walker, her usual medical attendant, on the evening of Saturday, the 22nd; he found her then suffering from sickness, and ascertained by a stethoscopic examination that she had disease of the heart.² She answered questions rationally but drowsily, and with her eyes half open. He prescribed for her, and the next morning (Sunday, the 23rd) she appeared better. Soon afterwards, however, she was taken ill, and died within two hours after his second visit.³

¹ I may here remark that I know nothing of the parties referred to in this case. In the latter end of December, 1873, an application was made to me by a highly respectable solicitor of Northampton, to undertake the analysis of the viscera of Mrs. Gulliver, and they were sent to the Chemical laboratory of this hospital for that purpose. As I have withdrawn from this branch of practice, I referred the inspector of police to a professor of chemistry, well skilled in the analysis of poisons, and an M.D. of the University of London. The inspector did not meet with this gentleman on calling at his house, and as the case was supposed to be urgent, he placed the viscera, by order of the coroner, in the hands of another.

² In one report it is stated that he saw her on the Friday evening, the 21st, and she was in her usual health.

³ 'Medical Times and Gazette,' January 17th, 1874, p. 72; see Reports in the

A servant girl deposed that her mistress was sick on the morning of the 22nd, and that she was very ill during that day. On the morning of the 23rd she went upstairs at about twenty minutes to 12 o'clock, and her mistress was then dead. She smelt scent in the room, not very strong (from the use of Eau de Cologne). The door and windows were open, and there was a great draught of air through the room.

The only account we have of the condition of the deceased after Mr. Walker's visit on Sunday morning, is that she ate a good breakfast of tea and toast, and afterwards asked Mrs. Waters to sit and read to her. After a time she complained of feeling faint, and of the room being close. Mrs. Waters saturated a handkerchief with Eau de Cologne, and spread it on the bed, and she opened the windows to let in fresh air. Mrs. Gulliver revived, and drank a glass of sherry and ate some toast. A chapter from the Bible was read by Mrs. Waters, and Mrs. Gulliver was repeating it after her when she suddenly stopped and fainted. The servant was called, and the doctor was sent for. Some sherry was poured into her mouth, which she swallowed, but she did not afterwards speak, and when her medical attendant arrived, life was extinct. This account of the symptoms preceding death is quite consistent with death from syncope as a result of disease of the heart. It is utterly inconsistent with poisoning by prussic acid or any narcotic poison.

The facts simply show that this was a case of sudden death. The deceased appeared better at half-past nine, and was dead at half-past eleven. There is no account of any special symptoms immediately preceding death, excepting those above-mentioned.

It does not appear that there was anything here to excite Mr. Walker's suspicion that the death of his patient was not natural. He had diagnosed disease of the heart, and in a woman of the age of seventy-three, of a spare habit, and weakened by an attack of illness, there was nothing more probable than that death should take place suddenly. He did not consider an inspection necessary, and he gave a certificate that Mrs. Gulliver had died of valvular disease of the heart.

'British Medical Journal' of January 17th and 24th, pp. 89, 113, and 125; as also in the 'Pharmaceutical Journal,' January 17th, p. 584.

When the body was examined for the inquest by Mr. Walker, about a month after death, the following appearances were met with:—All the organs were healthy, excepting the heart, which was in a state of advanced fatty degeneration, with its walls much thickened, In one of the kidneys a calculus was found. The vessels of the brain were not at all injected, and there was no other abnormal appearance.

The evidence on this part of the case was corroborated by Dr. Buszard, of Northampton. The result of the inspection justified the diagnosis made by Mr. Walker, as well as his opinion of the cause of death. There was nothing in the illness of the deceased, in the suddenness of her death, or in the condition of her body after death, which could have led him to suppose that his patient had died from some powerful poison administered to her “immediately prior to death.”

In giving his evidence at the adjourned inquest on the 8th January, 1874, Mr. Walker stated that the body of the deceased, on the day of her death—the 23rd, had a “high temperature,” from which it may be inferred that, considering the time which had elapsed since death, the body in his opinion maintained an unusual amount of warmth. At what period after death this casual observation of temperature was made is not stated, and the sole test of the alleged “high temperature” appears to have been the recollection of an impression conveyed to the hands a month before, and to which no importance was attached at the time. The conditions under which the body was placed, *i. e.* whether covered with clothes or exposed, are not noticed. The only fact reported is that at the time of the visit by the medical man, the doors and windows of the room were open, and there was a strong current of air through the house. It may be inferred that Mr. Walker could have attached no importance to the presence of this warmth in the dead body as any evidence of poisoning, or he would not have allowed the body to be buried under a formal medical certificate of death from heart-disease.

Under ordinary circumstances such an observation as this would have been passed over as unimportant and irrelevant to the inquiry respecting the *cause* of death. The presence of post-mortem heat in a body, when carefully and properly observed, has been hitherto employed to determine the probable

time at which a person died, so as to connect or disconnect the death with the presence of one charged with murder. It is a novelty in medical jurisprudence to find this maintenance of heat in a dead body positively set forth as furnishing any proof of death from poison.

Mr. J. E. D. Rodgers, who describes himself in a letter to the 'Times' as a toxicological expert of upwards of thirty years' standing, made a chemical analysis of the viscera of deceased, but he could find no poison which would account for death.¹

The evidence clearly showed that two hours before her death the deceased was seen by her usual medical attendant, and she was then pronounced by him to be much better. Mr. Rodgers in a letter addressed to the 'Times,' January 19th, says, "Mr. Walker proved that on the morning (Sunday, the 23rd) when he visited Mrs. Gulliver, he found her so much better that he apprehended no *dangerous consequences* from her illness, yet in two hours his patient died." There was nothing to indicate poisoning with morphia or any narcotic. Mr. Rodgers, himself, candidly admits "that the history of the case did not show that morphia was the immediate cause of death." Then the question comes—What was the cause? Was it disease of the heart, or was it a powerful poison?

As the deceased had died suddenly, *i. e.* within *two hours* after her medical attendant had pronounced her decidedly better, and progressing favorably, the chemical expert assigned it to poison. According to one report of his evidence, which has not been contradicted, he said—

"With the state of heart described, he should have expected Mrs. Gulliver to have had fainting attacks, and at any time a fatal syncope." When asked, however, whether he thought that Mrs. Gulliver's death arose from syncope, he said, "*No, certainly not syncope.*"

"Mr. Walker tells me that there was a high temperature (of the body) after death, and that would negative the idea that she had died from syncope." In reply to a question put by

¹ Morphia in traces, *i. e.* in unweighable quantity, is stated to have been detected in the contents of the stomach and in the oesophagus, but on this alleged discovery some remarks will be made hereafter. Death was not ascribed to morphia as a direct cause, but it was suggested that the alkaloid might have indirectly accelerated a fatal result.

Mr. Rea (the solicitor of Mr. Waters) the witness is reported to have said, "The state of the body after death—its great warmth—showed that the death did not arise from syncope." "Further, I would state, that in consequence of this high temperature I am of opinion, that she died from some *volatile noxious substance* given to her *immediately prior* to death, but which I am unable to detect." He subsequently made an addition to this statement, namely, that the *history of the case* after an experience of thirty years, would *not* permit him to say that death arose from natural causes.

The testimony thus given by Mr. Rodgers embraces three points of considerable importance in relation to medical evidence in future cases of sudden death demanding medico-legal inquiry.

1. It is stated or implied that in sudden death from syncope or a failure of the heart's action from disease or other causes, the body cannot retain a high temperature after death.

2. That in sudden death from volatile poisons, the heat of the body is abnormally maintained.

3. That fatty degeneration of the heart in an aged woman is not sufficient to account for sudden death by syncope. The cause of death assigned was some volatile poison given immediately prior to death, which could not be detected by chemical analysis.

It has been already stated that the only person attending the deceased during the last two hours of her life, was Mrs. Waters. These very positive and unqualified opinions expressed by the chemical expert, imputed to this lady an act of murder. The jury, it will be seen, framed their verdict on the medical hypothesis then put before them, but they declined to fix upon Mrs. Waters as the person who had given the supposed "volatile poison." An order was however immediately issued by the local magistrate, Lord Henley, for her arrest on a charge of murder; but before this could be put in force she had destroyed herself with strychnia.

For the sake of the public and profession, and for the protection of all who may be in attendance on the dying, and who may be likely to derive any pecuniary benefit, as relatives or friends, from the death of a person, it is desirable that these three propositions should be closely examined, in order to see how far they

are based on truth, and how far they are in accordance with medical experience, and with received medical facts and opinions.

1. It is affirmed that in death from syncope or failure of the heart's action as a result of disease or other causes, the heat of the body as represented by the vague terms "high temperature"¹ cannot be maintained.

In a paper published in these Reports by Dr. Wilks and myself, "On the cooling of the human body after death,"² we have given the record of one hundred observations made in this hospital with the thermometer, over a period of six months. The causes of death are there reported, and, among these, there were several in which death took place from disease of the heart, and from failure of the heart's action. In one of these cases, the temperature of the skin of the abdomen *two hours* after death was 84°, and in a second case 80°. In two other cases in which the temperature of the skin was taken in three hours after death; in one body it was 70°, and in the other 76°. In a case fatal by sudden hæmorrhage (syncope), the skin of the abdomen *four hours* after death had a temperature of 84°, and eight hours after death, 80°. The air of the room ranged from 45° to 50°. Each body was covered only with a sheet, and, therefore, it was favourably placed for rapid cooling. It will be seen, that in these cases, the skin maintained a temperature which would be very sensibly warm to the hand; in one, a temperature of 84°, at two hours after death. The reasonable inference from these facts is that there is nothing to prevent the manifestation of a high temperature in the body in cases of sudden death from diseased heart, or from failure of the heart's action.³

¹ It is much to be regretted that the exact time after death at which Mrs. Gulliver's body was seen and felt by Mr. Walker is not reported. The maid-servant states that she found her mistress dead at about twenty minutes to 12 o'clock. Mrs. Waters then sent her to fetch Mr. Walker, and it may be presumed that he was there in less than an hour, and that he actually felt the body before there had been sufficient time for it to cool, as the deceased was most probably in bed, and more or less covered with clothes.

² 'Guy's Hospital Reports,' 1863, p. 180.

³ In the case of the girl Buswell, who was found murdered in Great Coram Street in December, 1872, death was caused suddenly by excessive loss of blood. The great blood-vessels of the neck had been cut through. Although *ten or twelve hours* had elapsed when the body was first seen, it maintained an unusual

Dr. Goodhart has shown that in certain diseases terminating fatally, there may be sudden elevations of temperature at or about the time of death. The usual range in the healthy living body according to his observations is between 97° and 98.6° . In a fatal case of measles during the act of dying, it rose to 106° ; in two fatal cases of rheumatism, the temperatures were respectively 105° and 109° . The loss of a large quantity of blood has caused the temperature of the body to rise. In a case in which venesection was performed to thirty ounces, the temperature before the operation was 101.2° , in an hour after, it had risen to 102.6° . In a patient who had died from syncope by the rupture of a thoracic aneurism, the temperature soon after death stood at 99° . He very justly observes that loss of blood or *death from syncope*, does not necessarily imply, as some have supposed, a reduction of heat.¹

While Dr. Goodhart's observations clearly prove that there are remarkable ranges of temperature in the dying, those made by Dr. Wilks and myself, show that similar variations take place in the recently dead. In neither case is it possible with any certainty to connect them with the actual *causes* of death. In persons dying of the same disease, we may have an increase or diminution of temperature, and after death there may be the greatest variations in the rate and degree of cooling.

Dr. Goodhart appears to have anticipated the possible occurrence of a grave medico-legal error like that brought to light by this inquiry. In reference to a case of sudden death, he asks the question based on his own observations, "How far would disease be likely to act upon the normal temperature, and thus lead to the giving of an erroneous opinion?"²

In one case a body retains heat for an unusual length of time; in another, it loses it rapidly.

The causes of these variations are not apparent; but one fact clearly results from Dr. Goodhart's observations, namely, degree of warmth in a cold atmosphere. This was, no doubt, partly due to the body having been covered with the bedclothes. I am indebted to Dr. Lankester, the coroner, for this observation.

¹ "Thermometric Observations in Clinical Medicine," by J. F. Goodhart; 'Guy's Hosp. Reports,' 1870, p. 365. See also a paper by this gentleman on "Post-mortem Temperatures," in reference to the West Haddon tragedy, in the 'British Medical Journal,' March 7th, 1874, p. 303.

² Op. cit., p. 416.

that the temperature of a dead body at a given time after death, must *cæteris paribus* depend on its temperature at the time of death, and of this no observation was made in the case of Mrs. Gulliver.

Dr. Wilks found that, quite irrespective of the *cause* of death, a great heat may be in some cases retained for many hours by a dead body, both on the surface as well as in the cavities, and it has been noticed in certain fatal diseases that the temperature has actually risen in the body after death. Dr. Dowler has described this as a common occurrence in persons who have died of yellow fever or cholera. In one case, the temperature of the axilla, taken while the patient was living, marked 100° , in three hours after death it had risen to 104° , and in a third case a similar increase was observed in thirty minutes. In a death from malignant cholera he found after the lapse of an hour and a half that the dead body had a temperature of 109° .

A case fell under the notice of Dr. Wilks and myself, in which a man, æt. 53, died of Bright's disease and erysipelas. In two hours after death the skin of the abdomen indicated a temperature of 72° ; in four hours the thermometer had risen to 75° . It had thus increased in the dead body three degrees, although the temperature of the dead-house remained steadily at 42° , and the body had the same slight covering throughout. It was sensibly warm to the hand.

As we have elsewhere stated, "in some exceptional instances a really dead body may retain for some hours a temperature as high or higher than that which is usually found in the living."¹

The remarks hitherto made on the maintenance of heat in the dead body refer exclusively to death from *disease*. We are here reasoning as if in the case of Mrs. Gulliver the temperature of her body had been accurately observed with a thermometer by Mr. Walker. If in the above-mentioned instances, in which temperatures were increased, and observations specially made at regular intervals, there is so much difficulty in drawing safe conclusions respecting the duration and degree of post-mortem heat, what can be said of any medical opinion being based on a manual examination of a dead body casually remembered a month afterwards?

¹ 'Guy's Hosp. Reports,' 1863, p. 201.

The facts here quoted show that it would be most unsafe to rely upon such a rough mode of observation, and that the conclusion drawn from it in Mrs. Gulliver's case is, so far as it goes, contrary to all experience. There is nothing to prevent the bodies of persons dying from disease, from maintaining an unusual amount of heat after death, and the bodies of those who have died of the same disease, and have been exposed under the same circumstances, may greatly differ in temperature when observed at the same interval after death. One may be quite cold in nine hours, and another may retain its heat to such a degree as to be quite warm to the hand after ten hours! Instances of this kind have been reported in works on medical jurisprudence. Owing to the unusual retention of heat, doubts have often arisen in such cases as to the reality of death. This was the case with the late Professor Dieffenbach, of Berlin. His body retained a high temperature for so long a time that it was supposed he was only in a state of apparent death.¹ It was not suggested from the condition of his body that he had not died from natural causes.

Sir R. Christison states that he has had occasion to observe, in reference to the dead brought into the Royal Infirmary, the long maintenance after death, of a degree of heat most sensible to the hand, but this had no relation to the cause of death.²

2. It is assumed that in sudden deaths from a volatile poison, such as prussic acid, the heat of the body is so abnormally retained as to become a criterion of the cause of death, and to create a distinction between death from syncope as a result of heart-disease, and death from poison.

Passing over the loose and imperfect observation on which this medical opinion was founded, the untrustworthiness of which would have been soon made apparent by cross-examination in a Court of law, we may admit that the dead body of Mrs. Gulliver, when seen by Mr. Walker soon after death, was unusually warm. Where are the medical facts to justify the inference that this abnormal heat furnished a proof of death from a volatile or any other poison?

Referring to the works of the ablest writers on toxicology, I do not find any case recorded in which the unusual retention of

¹ 'Guy's Hosp. Reports,' 1863, p. 199.

² 'British Medical Journal,' Jan. 17th, 1874, p. 125.

heat in the dead body has been described as a characteristic of poisoning by prussic acid or of volatile poisons generally. Such a condition as this, if it had existed, would certainly not have escaped notice. Many cases of poisoning by this acid have been referred to me during the last forty years, with a full description of the appearances, but in no instance has the unusual maintenance of heat been observed or described.

In many experiments on animals with prussic acid and other volatile poisons, I have not observed that the warmth of the bodies was retained beyond the usual period; but, having a due regard to the temperature of the atmosphere and the circumstances under which the bodies were exposed, the rate of cooling took place as in death from natural causes.

In cases of sudden death, from whatever cause, assuming the heat to be normal and the circulation in full vigour at the time of death, the body is usually more slow in losing its temperature; but this observation applies equally to death from syncope from disease of the heart, as well as to death from prussic acid.¹

This would probably sufficiently account for Mr. Walker's manual observation on the high temperature of the body; if not, it might be an exceptional case like those recorded by Dr. Davy, Dr. Dowler and others, in which unusually high temperatures have occurred spontaneously in the dead.

Sir R. Christison, in giving his opinion on this subject, says, "I have never had occasion to attend to the condition of the dead body as to the maintenance of warmth in any instance of poisoning; but if such maintenance of warmth do occur after death from any species of poison, I cannot, in face of what is stated above, admit that such a phenomenon is any evidence of death by poison, or even a just ground of suspicion of poisoning."²

The statement referred to in this paragraph, relates to Sir R. Christison's special observation (when clinical professor in

¹ In the convulsions attending on strychnia great heat is evolved. I have not observed that in animals there has been any unusual retention of heat. In a case of poisoning with strychnia, communicated to me by Mr. Clegg, Coroner for Boston, a woman died in three hours from the effects of this poison, and it was observed that in this short time the body had become cold and rigid.

² 'British Medical Journal,' Jan. 17th, 1874, p. 125.

the Royal Infirmary) of "the long maintenance after death of a degree of heat most sensible to the hands of others as well as my own, both on the external surface and in the cavities of the human body. These were all cases of natural disease."

3. It is assumed that fatty degeneration of the heart in an aged woman is not of itself sufficient to account for sudden death by syncope. The cause of death was therefore assigned by the expert to some volatile poison given immediately previous to death, which could not be detected by chemical analysis.

In this case, whether death was caused by disease of the heart, was not so much a toxicological as a pathological question, requiring, not chemical, but special medical experience. Persons labouring under fatty degeneration of this organ are liable to die suddenly from a failure of its action.¹ When the person is seventy-three years of age, and is weak or debilitated by a slight attack of illness, such a result may be fairly expected. The aged patient may appear better and progressing favorably, and yet be found dead within a much shorter period of time than two hours. Death sometimes takes place in a few minutes without any previous warning.

The most distinguished writer on toxicology in this country, Sir R. Christison, has put on record a warning to all chemical and toxicological experts, in forming an opinion of the cause of death in these cases.

"Death often takes place in sudden syncope in *organic diseases of the heart*. Such cases may be confounded with the most rapid variety of poisoning with hydrocyanic acid; and if the duration of the symptoms preceding death is unknown,

¹ The late Dr. Barlow has pointed out that fatty degeneration is accompanied by wasting of the muscular structure of the heart, whereby its propelling powers are weakened and dilatation takes place to a greater or less degree. Under any, even the slightest, additional obstruction or exertion, death may ensue from a sudden failure of the circulation. Thus, fatal syncope may be induced by the exertion of sitting up in bed, or of getting out of bed, or straining at stool ('Practice of Medicine,' p. 345).

In a case in which I was consulted, some years since, by the late Mr. Thomas Wakley (the coroner), a man labouring under disease of the heart and lungs died suddenly from syncope on raising himself into a sitting posture in bed. In this case poisoning was suspected, but an analysis proved that there was no poison, not even in "traces," and the death was satisfactorily accounted for without resorting to the hypothesis of an undetectable volatile poison. These remarks are applicable to the case of Mrs. Gulliver.

they may give rise to a suspicion of poisoning generally. But they are at once distinguished by the morbid appearances. A trivial organic derangement may be the occasion of instant death."¹

In Mrs. Gulliver's case a medical gentleman of some experience had already certified the cause of death, and the subsequent examination of the body substantially confirmed the correctness of his judgment. In the face of this medical opinion on a purely *medical* question, death was attributed by the chemical expert to the use of some volatile poison not discoverable by chemical analysis! There was no proof of the nature of the poison, or of the fact of possession, or of any act of administration by the accused.² There were no symptoms, no appearances in the body, and no chemical proofs forthcoming.³

Had this medical testimony been given before a jury of intelligent men, such as a grand jury at the assizes, its unsatisfactory character would have been at once exposed. To a certain extent it was accepted by a rural jury at a coroner's inquest, but even they could not go so far as to adopt the conclusion to which it necessarily led, namely, that Mrs. Waters had been guilty of murdering her relative.

The chemical hypothesis of poisoning constructed in this case is wholly untenable. It is not only without a medical fact to support it, but it is directly opposed to the evidence derivable from the morbid appearances observed in the body. If a poison had been found which might have caused sudden death, a conscientious medical witness would still have had to consider how far death might have depended on disease of the heart. As no

¹ 'Treatise on Poisons,' 4th ed., p. 686.

² In a report in the 'Pharmaceutical Journal' (Jan. 17th, 1874, p. 585) prussic acid is suggested as the suspected poison. This, as well as all other volatile poisons which cause death rapidly, has a strong and very persistent odour and it is worthy of remark that Mr. Walker, who was summoned almost immediately and found the body of a high temperature, did not perceive any odour, or he would have had his suspicions aroused.

³ Two small bottles were found in a bag belonging to Mrs. Waters. One was empty and the other contained a small quantity of a solution of strychnia, a part of that which she had taken for the purpose of self-destruction. There was evidence that she had procured from Mr. Walker nine grains of acetate of morphia about three months before this event. She stated that she required it for medicinal purposes, that she had used some of it, and there was a portion still remaining.

poison could be detected, there was really no foundation for the statement that the deceased had died from poison, and the only opinion which the *medical* facts justified, was that death had been caused by disease of the heart.

It is usually considered as a rule in medico-legal practice that those who allege poisoning, are bound to prove the fact by clear, conclusive, and satisfactory evidence. If the course adopted by the chemical expert on this occasion should be drawn into a precedent for future cases, many innocent persons may be placed in great jeopardy. It would be dangerous for a relative to attend on one labouring under heart-disease or any other disease likely to cause sudden death, and any person who happened to be the only one present at the time of death might find himself unexpectedly involved in a charge of murder by poison.

The conclusions which the *medical* facts of this case appear to me to justify are—

1. That the deceased died from syncope as a result of disease of the heart.

2. That this natural cause of death is consistent with the maintenance of warmth in the dead body.

3. That in a case of sudden death from syncope, the heat of the body may or may not be maintained for some time after death, and this maintenance of heat forms no distinction between death from heart-disease and poisoning.¹

¹ In drawing these conclusions I am glad to find that they are substantially supported by such experienced men as Sir R. Christison, Dr. Wilks, and Dr. Moxon, the two latter having had unrivalled experience in the examination of the dead. Dr. Moxon says, "Assuming that Mrs. Gulliver's case was one of those in which death takes place by syncope, I shall proceed to show that these are precisely the cases which would probably retain heat for an unusually long period after death. . . . It is in malignant cholera (in which people die of syncope) that the temperature rises remarkably after death. . . . What volatile noxious substance is there which would not be detected, and yet would produce a high temperature after death? Surely this question needs a substantial answer. . . . Any facts showing that volatile noxious matters produce a high temperature after death would be very important, and, I think, would be entirely novel additions to medico-legal knowledge. The evidence, as quoted, appears to me to be astounding. It recalls the time when vague suspicions of poisoning roused the jury-furnishing classes to ruthless mutual murder, and it cannot be surprising if it upset the balance of an overstrained mind." (*British Medical Journal*, Jan. 24th, 1874, p. 126.)

Referring to the opinion expressed by the chemical expert, that the death of

In a coroner's inquest there can be no *venire de novo*. An erroneous medical opinion can only be exposed when a case is brought before a Court of assize. The grave has closed over the body of this unfortunate lady, who was, as I believe, wrongly implicated in a charge of murder, and there is now every reason to accept as true, the statement which she emphatically made to her husband shortly before her death when the charge of poisoning was communicated to her, "*I never gave the deceased anything.*" There is truly no *medical* evidence to show that any noxious substance was given by her to accelerate or cause the death of Mrs. Gulliver, and what is called by the expert "the history" of the case cannot supply the place of medical facts. Nothing has been reported in the history of this case which is not perfectly consistent with the innocence of Mrs. Waters.

In a letter written by the chemical expert to the 'Times' all the main medical facts are left uncontradicted and unexplained. He dwells on the fact that the deceased was better on the morning of her death, but in *two hours* she was dead, and when her medical attendant came he found all the doors and windows open, and a great current of air passing through the

Mrs. Gulliver was not owing to fatal syncope as a result of fatty degeneration of the heart, but to some unknown volatile noxious substance, the editor of the 'British Medical Journal' declares it to be "without foundation in fact and without justification even as a suggestion. Regarded as a statement produced on oath before an ignorant rural jury, in a case involving life, and looking to the consequences to which it led, we find it difficult to characterise such evidence as it deserves. . . . The chemical expert assumes the guilt of the individual, and invents a poison of which he finds no traces, as the probable agent of her guilt. So monstrous a perversion of reason and so wild and mischievous a misuse of the scientific imagination were surely never before seen in a British court of justice, or what professes to be such." ('British Medical Journal,' Jan. 24th, 1874, p. 113.)

The editor of the 'Medical Times and Gazette,' after reporting the case, says, "We think the medical evidence in this case is exceedingly unsatisfactory, and such as did not warrant the conclusion at which the jury arrived. On what grounds did Mr. Rodgers assume that some volatile poison had been administered to the deceased? There was certainly no evidence of its having been administered. The medical witness always treads on dangerous ground when he assumes anything which is not fortified by unequivocal facts. It is always better to keep to the strict rules of evidence, not only in justice to a suspected person, but for the sake of justice itself." (Jan. 17th, 1874, p. 73.)

house. These facts furnish no proof that Mrs. Gulliver died from a volatile poison. Fatty degeneration of the heart may cause death in less than two hours, and, with regard to the open windows, it would appear that they were opened at the request of the deceased, who may have felt faint; or, seeing that the deceased was fainting, Mrs. Waters may have opened them to revive the deceased, and not for the purpose of getting rid of the smell of the prussic acid or other volatile poison which was alleged to have been given to her immediately before death.¹

A man professing to act as a medical jurist is not justified in basing an opinion, carrying with it momentous consequences to the lives and reputations of others, upon any facts except those which are strictly of a *medical* nature. It is for a coroner, a magistrate, or a judge at the assizes, to receive or reject as evidence, facts which are non-medical. If a chemical expert allows his mind to be biassed by facts or circumstances of this kind, he is almost imperceptibly led to mould his evidence so as to fit into what may be a popular theory. Some important medical facts may be ignored, while others may be unduly strained, and circumstances which should not affect his opinion at all, are made by the witness the basis of evidence which may endanger the life or liberty of another.

The causes of this evil are not far to seek. A coroner's jury, as it is usually constituted, is not fitted to deal with such a case

¹ It would be unjust to assume that the act of suicide on the part of Mrs. Waters under such circumstances was any proof of conscious guilt. Suspicion and charges had been hanging over her for a month; and when she was informed of the opinion of the chemical expert given at the inquest, that her relative had died from poison, and she would have to answer a charge of murder, her mind gave way under the weight of such a terrible accusation. It is not many years since that the scientific world was startled by the announcement of the sudden death of an eminent professor of chemistry in this metropolis. He had been charged with an unnatural offence, and on the morning on which the charge was to be heard before a London magistrate he was found dead in his laboratory from the effects of prussic acid. He had not the fortitude to meet the accusation thus publicly made. All who knew him believed that the charge was false. This is not the only instance of the kind. When charges for unnatural offences against persons of good moral standing were more frequent, there is reason to believe that more than one innocent man destroyed himself to avoid the public odium arising from such a charge. An accuser was generally associated with a witness, and the oaths of two persons were thus brought against the accused.

as that of Mrs. Gulliver. Any statement strongly made on oath by one calling himself an expert or professor, will be generally accepted, although he may be only half qualified, and really have had no experience on the actual points involved in the questions submitted to him.

If the answer given is of a rash or reckless kind, the coroner, not having sufficient medical knowledge, may not perceive it, and a statement which would be at once condemned by all who had had experience on the subject, will pass unchallenged and form an erroneous basis for the verdict of the jury.

Mr. H. W. Rumsey truly says—

“We have been told of the valuable protection afforded to the public by this ancient institution; but when all the froth of so empty a boast has subsided the plain fact remains, that a very large proportion of coroners’ inquests leaves the real cause of death wholly unexplained. Hence our medico-legal investigations have sunk to a very low ebb, both at home and abroad.”

Again, “The custom of indiscriminately summoning medical practitioners of all sorts, and of all degrees of pathological knowledge and forensic skill, has sadly depreciated the value of medical evidence in courts of justice.”¹

Referring to the case of Mrs. Gulliver, Dr. Moxon says, “It is plainly time that some good knowledge of the subject should be caused to reach the advisers of juries (coroners). I cannot help thinking that the present case (the case of Mrs. Gulliver) pointedly shows the necessity of having a competent and responsible Government officer, who should supervise, examine, and estimate the medical evidence offered in the courts.”²

The initiation of criminal proceedings in a case involving a charge of murder by poison, is often left to a coroner’s beadle. If an important chemical analysis is required, the viscera of the deceased are sometimes carried from one “analytical chemist” to another, until some one is found prepared to undertake it for the low statutory fee allowed by the Act of Parliament. The qualifications of the individual who undertakes the analysis are not sufficiently inquired into. A surgeon may thus be called

¹ ‘*Essays on State Medicine*,’ pp. 355, 357.

² ‘*British Medical Journal*,’ Jan. 24th, 1874, p. 126.

upon to answer abstruse chemical questions, and a chemist may be asked to state his views on subjects purely medical or pathological and requiring special medical experience. If clever barristers are not engaged to sift these statements, there is no limit to the range which the examination may take, and a rural jury may be thus induced to look upon any hypothesis put forward *pro hac vice* as true, and base their verdict upon it. The whole system requires reformation, and until this takes place, we must be prepared to meet with such tragical cases as that which is described in this paper.

Since the above pages were written, I have stood by the bedside of a friend, a lady, æt. 65, who died from syncope as a result of disease of the heart, after an illness of four days. Within four hours of her death she was decidedly better, and able to take food and converse. Her niece was alone with her when she died. There was nothing unusual in the temperature of the body or in the rate of cooling.

On "Traces" of Poison, and the Value of Medical Evidence from Traces.

In the case of Mrs. Gulliver it is stated that morphia was found in traces, i. e. in an unweighable quantity in the stomach and contents, as well as in the œsophagus, but it was only doubtfully present, if present at all, in the liver, kidneys, and blood. The statements regarding the detection of this alkaloid are confused; but it is admitted that "death was not the result of a narcotic poison administered on Saturday" (Report in 'Pharmaceutical Journal'), but that "death must have been accelerated by the administration of morphia" (Report in 'Medical Times and Gazette').

The question here presents itself, Is there any satisfactory evidence that the deceased had taken morphia during any part of her illness? Mr. Walker did not prescribe it. It appears that some three months before the death of Mrs. Gulliver, he had supplied to Mrs. Waters, at her request, nine grains of acetate of morphia, as she said, for medicinal use; hence, assuming the chemical inference to be correct, it might be suggested that the traces of morphia found in the stomach of deceased, were derived from some portion of the acetate which had been traced to her possession three months before the death of Mrs. Gulliver.

Traces are usually considered to represent the residue of a large or poisonous dose. If only *one grain* of acetate of morphia had been given to Mrs. Gulliver, it is certain, considering her age (seventy-three), her debilitated state, and the

diseased condition of her heart, that she would not only have had the well-marked symptoms of poisoning with morphia, but have died in a few hours from the effects. I have a note of a case in which *one grain* of acetate of morphia destroyed the life of a lady. Narcotic symptoms came on in half an hour, and she died in nine hours. I have known four other cases, in which comparatively strong adults were killed in every case by one grain of a salt of morphia. The acetate of morphia is very soluble, and is, therefore, rapidly absorbed, producing symptoms usually in from five to twenty minutes, these symptoms being dimness of sight, general weakness and relaxation of the muscles, the face and hands congested, of a livid or bluish colour, the skin cold, an irresistible tendency to sleep, followed by stupor, complete insensibility passing into coma, with stertorous breathing. The pupils are remarkably contracted.

On the Friday and Saturday Mrs. Gulliver manifested no symptoms of this kind. On the Friday evening she was seen by her medical attendant, and he found her unusually well. On Saturday he saw her about 5 p.m.; she was sleepy, and answered questions drowsily. He applied the stethoscope, and found she was suffering from heart-disease. She appears to have passed the night without any unusual symptoms, and the next morning he found her much better, and progressing most favorably. Either experience of the action of poisons goes for nothing, or such a state of things is perfectly inconsistent with the theory that acetate of morphia in any quantity had been administered to the deceased by Mrs. Waters. If she had taken the acetate only shortly before Mr. Walker's visit on the Saturday, there would have been something more than drowsiness, and she would most probably have died in a state of unconsciousness during the night. This is on the assumption that no more than one grain had been administered. If the quantity had been greater, the effects would have been so manifested that Mr. Walker's stethoscopic examination for disease of the heart would have been quite superfluous. The deceased would have died in a few hours with coma and other unmistakable symptoms of narcotic poisoning.

From the time that Mr. Walker saw the deceased on Sunday morning until her death, two hours afterwards, she retained her consciousness and sensibility. There is no suggestion that acetate of morphia was given to her at this time, and how, therefore, are we to account for the "traces" said to have been found in the contents of the stomach? The chemical expert assigned as a reason "that the vomiting would account for so small a quantity of morphia being found, if *there had been a larger quantity administered*;" but unless we assume that a large quantity of this powerful poison could have been taken by an aged woman without producing any of the usual effects, this suggestion must be rejected. Besides, there is no evidence of the deceased having been sick except on the morning of Saturday, the 22nd, and this large dose could not have been in her stomach then, or she would have been dead before the morning of Sunday. Mr. Walker saw her in the evening of the 22nd. For the reasons already stated, the larger dose (assuming a fatal dose of one grain) could not have been taken by deceased before she was seen by Mr. Walker on Saturday at five o'clock, for the whole would have been absorbed within sixteen hours and have produced fatal effects. In a case in which one grain had been taken by mistake I found that the morphia had entirely disappeared from the stomach in ten hours. In another communicated to me, in

which a man died in thirteen hours from a dose of one grain of the hydrochlorate, taken in a pill, no morphia could be detected in the contents of the stomach.

That any portion of the soluble acetate of morphia should be present in the contents of the stomach of Mrs. Gulliver, is quite contrary to experience and the physiological action of this poison. We may now fairly ask the question, Can "traces" be relied on as satisfactory evidence in a case involving a charge of murder by poison? I would reply, Yes, if symptoms and appearances can be brought forward in corroboration, but certainly not otherwise. In this case there were no symptoms of poisoning by morphia, and the appearances on inspection showed that the vessels of the brain were not congealed.

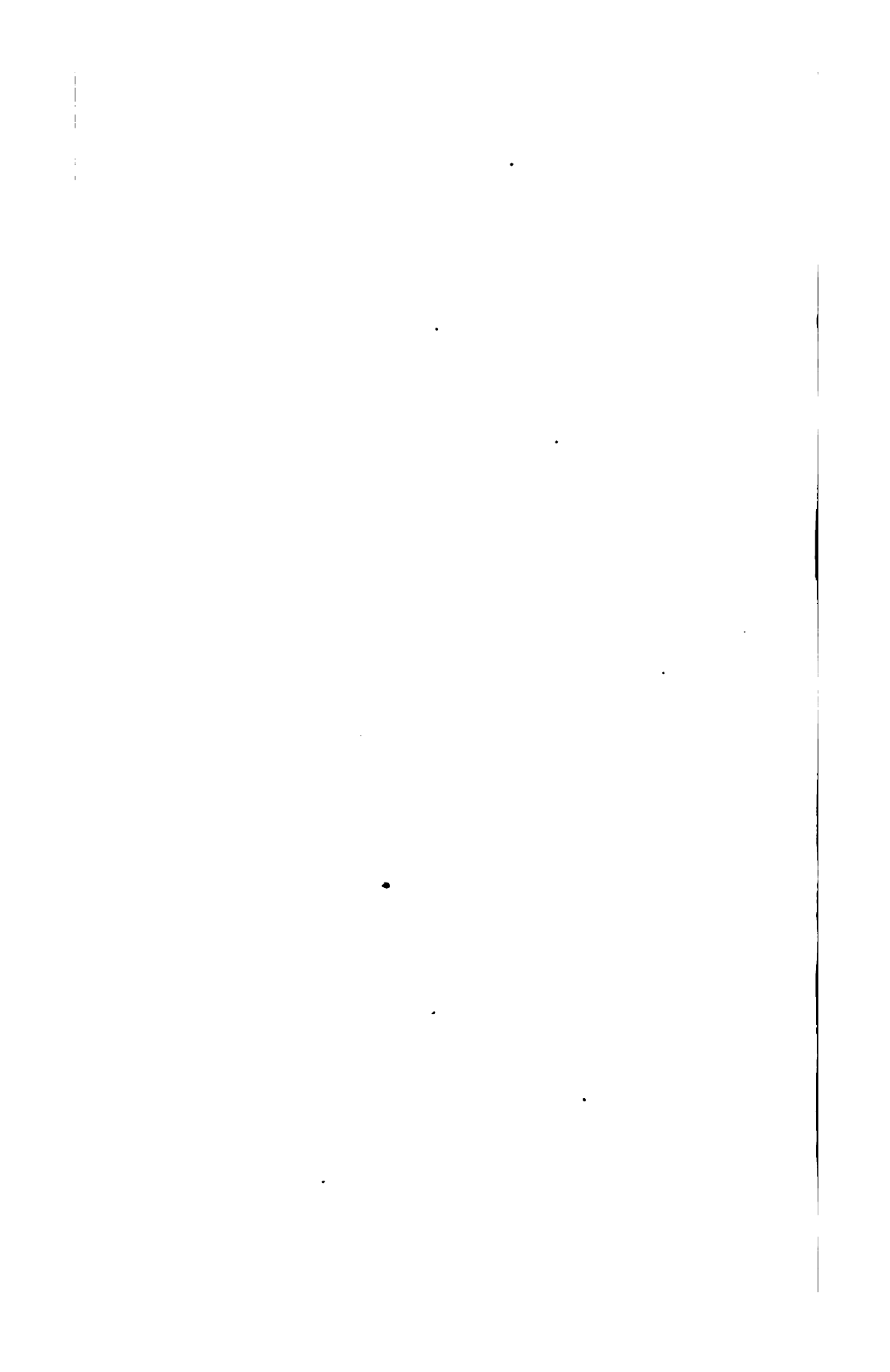
"Traces," or unweighable quantities, are the *ignes fatui* of toxicologists. One analyst will rely upon the chemical effects produced by the five hundredth of a grain, another will put his faith in the thousandth, and a third will even go to the one hundred-thousandth or the millionth. I have known an expert to come to the conclusion one day that he had discovered "traces" of poison, while the next day, on further consideration, he rejected the chemical results as unsatisfactory, simply because the quantity was too small to admit of any fair or reasonable corroboration. In an examination, made some years since, of an important case of alleged murder by poisoning, in which I was joined with the late Dr. Miller and another experienced chemist, two of us considered that there were "traces" of the poison in a certain organ, and one, that they were not reliable. As there was this difference of opinion, we rejected the results as unsatisfactory.

In the case before us the expert candidly states that in the liver of deceased he found the presence of an alkaloid, but there was not sufficient to enable him to determine its character. He had, therefore, clearly reached the ultimate bounds of his chemical tests. Another analyst, finding this alkaloid in the liver, might have been satisfied with the results, and pronounced it to be morphia. *Quot homines tot sententia.* Thus, the case of a person suspected of poisoning may fall under the hands of one endowed with more chemical enthusiasm than others, and he may be disposed to rely upon "traces" which others would consider too doubtful to produce as evidence. Perhaps the analyst may have been informed that the accused had purchased a certain poison, or had been known to have it in his possession. In his eagerness to discover a crime he may place too much reliance upon the results, and believe that he has really discovered traces of this poison. *Quod volunt homines, id facile credunt.* It is not the skill or honesty of the operator which is here called in question, so much as his discretion. In a common case in medical practice, analysts may speak of detecting "traces," and thus lend an aid to pathology and diagnosis. If an error is committed no harm is done. It is widely different in medico-legal practice. In the case of a person charged with murder by poison, a reliance upon "traces" may unjustly place him on trial for his life.

Beyond doubt, some poisons may be detected in smaller quantities than others. A witness might rely upon traces of arsenic, but he would hesitate to swear to the presence of such an alkaloid as morphia when operating on an unweighable quantity. No toxicologist has worked the question to a greater or more minute extent than Dr. Wormley, an American professor of chemistry and toxicology. He has determined the limits of all the known tests for all ordinary poisons

(*'Micro-Chemistry of Poisons'*). Referring to morphia, he says (p. 483)—“No one of the tests, taken alone, is peculiar to the alkaloid. It must be admitted, however, that in regard to delicacy of reaction the tests at present known for the identification of morphia are inferior to those of many of the other alkaloids, and, moreover, this alkaloid is more difficult than most others to separate from foreign organic substances.”

Leaving out of the question the skill of the analyst and the nature of the substance, there is one universal and satisfactory test by which the existence of “traces” of poison may be confirmed or disproved. No poison can be taken into the living body or remain in the body without producing, sooner or later, certain well-known effects. If this physiological evidence is not forthcoming, it is far more probable that the “unweighable” substance has deceived the analyst, than that an active poison can have been taken without producing symptoms or destroying life. For this reason, as there is nothing to corroborate the alleged detection of morphia in the case of Mrs. Gulliver, and no symptoms of poisoning with morphia really existed throughout her illness, I decline to accept the conclusion that there were any traces of morphia in the contents of her stomach. In a case of this magnitude, and involving so serious an issue, I prefer relying upon conclusions derived from physiology, rather than upon speculations based on transcendental chemistry.



TWO CASES OF
INTERNAL INTESTINAL OBSTRUCTION
TREATED BY OPERATION.

By H. G. HOWSE, M.S.

THOUGH cases of internal intestinal obstruction are sufficiently common in the wards of our hospitals, yet their treatment is still in a very uncertain state. It seems, therefore, desirable that cases like the following should be recorded. I think it will be best first to give the notes of each case, and then afterwards compare them, only premising that I mean by "internal" obstruction any constricting cause placed internal to the muscular and fascial walls of the abdomen. Thus, I include in it the various forms of peritoneal hernia. As far as retro-peritoneal hernia is concerned, this has always been the usage, but the custom has been much more doubtful as regards those curious forms of hernia occurring in connection with the peritoneum on the anterior abdominal wall, *i. e.* between the transversalis fascia and the parietal layer of peritoneum. These cases have been much more commonly described under the head of external strangulation, than under that of internal, the reason probably being that they are very frequently accompanied by a history of external hernia. It is evident that, mechanically, this is not correct, for it must be admitted that the proper limits of the abdominal cavity are its muscular and fascial walls, and that the peritoneum ought to be regarded as part of the

contents of the abdomen. Otherwise we shall have the anomaly, as the peritoneum passes over the viscera, of speaking of the intestines, &c., as being external to the abdomen !

(For many of the details in the following cases I am indebted to Messrs. Day, Paul, and Chicken, clinical assistants.)

CASE 1.—W. M—, æt. 56, labourer, was admitted into John Ward on September 29th, 1873, under the care of Dr. F. Taylor, but afterwards transferred to Dr. Habershon on account of the commencement of the winter clinique.

The only history of previous illness is that, seventeen years ago, he suffered from obstruction of the bowels, believed to have been induced by long abstinence from food. He was then ill for five days, and was finally cured by an enema. On September 21st last, having been quite well previously, he ate some tainted meat. The same night he was taken with severe colicky pain in the abdomen, and next morning he vomited offensive matter smelling like fæces. He was seen by a doctor, who gave him effervescing mixture and enemas, but these failed to produce any action of the bowels. Day by day he got worse, until he resolved to seek admission into the hospital.

State on admission.—Well nourished, but with a peculiar pinched, haggard expression of countenance. The abdomen was slightly tumid, everywhere resonant, except for a space about four inches by three, above and parallel to the right Poupart's ligament. The peristaltic action of the intestine could be distinctly seen everywhere, except over this space, which was dull on percussion and communicated a slight feeling of resistance to the hand, different to that on other parts of the abdomen. This feeling was very vague, not like that of a hernia, of which there was no history ; it was thought it might possibly be due to fæces lodged in some particular portion of the intestine. The inguinal canals were quite clear ; no impulse on coughing.

Lungs, heart, &c., quite healthy. Pulse 90, small and wiry. Temperature 99°. Passes a moderate amount of urine ; no albumen. Left pupil contracted, affected with anterior synechia ; only a small perception of light, but all history of syphilis denied.

September 30th.—At a consultation held to-day for the purpose of considering the advisability of opening the abdomen, the diagnosis of intestinal obstruction from adhesion or band was arrived at, but it was considered not expedient to operate, on account of the difficulty of ascertaining the position of the adhesion. Chloroform was, however, given, and manipulation practised with the idea of breaking down any adhesion that might exist, and thus setting the intestine free.

October 1st.—Remains in just the same state as before the chloroform was given. Constant stercoraceous vomiting. From this date up to October 7th the treatment consisted principally of injections and opium. Very various injections were tried, amongst them castor oil, turpentine, soap and water, gruel, olive oil, &c. On October 7th Dr. Habershon sent for me to see the patient again, and as everything had failed, expressed a very decided wish that I should cut down upon the abnormal dull patch in the right inguinal region and see if there was anything there. The abdomen was then very tightly distended, peristalsis of the intestine very plainly visible, but the pulse was below 100 and the temperature only 99°. The faecal vomiting had been constant and severe.

Chloroform was accordingly given, and an oblique incision made about four inches long, one inch and a half above Poupart's ligament; and parallel to it. All the structures forming the abdominal parietes were divided, and then the peritoneum was reached projecting somewhat like a cyst, so that it gave rise at first to the impression that I had reached the sac of a hernia. On puncturing it the fluid escaped in a jet,—serum slightly tinged with blood. On passing the finger into the opening, an immensely distended coil of intestine was felt, covered with lymph on the surface, and intensely injected, just as we see in an old strangulated hernia case. The finger could be passed down to the brim of the pelvis and outwards as far as it would go, so that it was apparently in the abdominal cavity. On passing it deeply towards the spine, a band was felt bridging over a portion of the intestine, which was much constricted at this point. This band was tied in two places with a carbolised gut ligature, and divided in the centre. On examining the portion of the intestine underneath this band, it was found absolutely cut into by the constriction, and faeces

were freely escaping. The loop of the intestine was consequently drawn out of the abdominal cavity, and the ulceration sewn up,—not, however, before there had been a considerable extravasation of fæces into the peritoneal cavity. The process of sewing up the intestine proved a rather difficult one, for the mesentery opposite the constriction had become so contracted that it was not easy to bring the ulceration within reach. No other cause of constriction could be felt, and as this was manifestly sufficient to cause the symptoms, the intestine was returned into the abdominal cavity,—great difficulty being experienced in doing so on account of its immensely distended state,—and the wound sewn up. The man died four hours after the operation.

At the post-mortem abundant evidences of peritonitis were found. The divided band was the only source of obstruction; it was readily found on account of the double ligature attached to the divided extremity. It was about one inch a half in length, of a tough fibrous consistence, and of a white shining colour. It was attached at either end to the mesentery,—one end to one side, the other end to the other side; but the points of attachment were not exactly opposite each other, but separated for a distance of about an inch. The lower attachment was close by the ileo-cæcal valve, the upper attachment higher up. It must be remembered that the free edge of the mesentery in which the intestine is placed is very much greater in length than the edge attached to the spine. The latter is only four or five inches long, extending from the second to the fourth lumbar vertebræ, while the former corresponds to many feet of intestine. Consequently, though the attached ends of the band were not separated for a greater distance than one inch, the loop of intestine corresponding to this, amounted to as much as two feet. Strangulation had been probably caused by excessive peristalsis set up by the tainted meat. An inordinate length of intestine had in this way got carried under the loop, and with it a certain amount of mesentery, so that it became unduly pressed upon. In all these cases, when from any trifling cause the strangulation is once begun, the swelling of the parts beyond the constriction causes it to proceed at a doubly rapid pace, and renders reduction quite impossible. A familiar example of this may be given in a case of paraphymosis, where

the narrow orifice of the prepuce may be readily drawn over the glans in the undistended condition, but when erection takes place, the orifice becomes too tight, the glans becomes swollen, œdematous, and inflamed, and reduction becomes quite impossible, until the constriction is divided. Just so with the intestine; strangulation having begun from a slight excess of peristalsis, the bowel involved begins to swell, becomes congested and inflamed, and thus, until the constricting cause is removed, there can be little hope of the bowel returning to its normal condition. Underneath the band a line of sloughy tissue was found, and from the oblique way in which it extended across the mesentery it was evident that the strangulation must have been caused in the manner described. The ulceration in the intestine was found well brought together by the sutures, and although this portion of the gut was excessively soft and lacerable, no further extravasation had taken place. Death had probably been caused partly by the shock of the operation, partly by the extensive extravasation of fæces which had taken place. As the patient was almost *in articulo* before the commencement of the operation, it cannot be supposed that the end was hastened more than a few hours by what was done.

The carbolic spray was used in this operation until it was found necessary to draw the intestine out and expose it to the air; it was then discontinued, for fear of its too great cooling influence; the intestine, as far as possible, being simply protected by lint soaked in warm carbolic solution.

The difficulty of returning the immensely distended coils of intestine was so great in this case that I should, in any similar emergency in the future, not hesitate to puncture the intestine with the finest size aspirating needle in two or three places, so as to allow the flatus to escape. I could not help considering afterwards that part of the very rapid fatal result was due to the return of the intestine in this state,—the abdomen, when sewn up, being quite drum-like in its tenseness. Indeed, I was very apprehensive, while doing it, that I should break down the intestine at the point of suture, where it was excessively lacerable. The distension must, moreover, add very considerably to the patient's distress from its pressure on the diaphragm. On the other hand, no fear need be entertained of fæcal extravasation through the punctures. I have done it two or three times

myself in different cases, and have seen it done on many occasions with no visible bad result. As is well known, the mucous membrane everts through these minute punctures, and quite prevents any risk of extravasation.

CASE 2.—F. E—, æt. 33, a German, speaking English imperfectly, farrier by trade, was admitted into John Ward under the care of Dr. Wilks on December 11th, 1873. He is a healthy-looking man; says that he has never suffered from any illness, except quotidian ague at the age of fourteen in Germany. Three years ago he ruptured himself (right inguinal bubonocoele), and has since worn a truss in the daytime, taking it off, however, at night. This rupture has not troubled him at all; he has rarely seen it down, and it has then been always readily reducible. The last time it came down was on the night of Monday, December 9th, about the size of a hen's egg; it disappeared of itself while lying down; he does not exactly know how, but he is certain that he did not apply any force to reduce it himself. He has been unwell for the last fortnight, under medical care for cold and cough, caused by the late foggy weather. He did not have any trouble with his bowels until December 10th, when he had severe griping pain, attended with vomiting, so that he was unable to go to his work. Since that time he has been getting worse; he has taken aperient medicine, but has had no action from the bowels, nor has he passed any flatus.

On admission he complained of much pain in the abdomen, which was, however, not much swollen, nor was there any visible peristalsis upon the surface. It was uniformly resonant except in the right inguinal region, where there was an ill-defined swelling about three inches in diameter, placed above Poupart's ligament. Although I have spoken of it as a tumour, yet it was not visible to the naked eye, and was only recognisable by pressing the fingers carefully in the region indicated. The external abdominal ring was very patent, and on passing the finger along the inguinal canal the same sense of resistance, as previously described, was perceptible. Heart healthy. Pulse 90. Evidence of slight bronchitis about the lungs. Urine normal, moderate in quantity. The treatment prescribed was opium in frequent doses and gruel injections.

On December 13th, the injections having been ineffectual, and the vomiting continuing, I was requested by Dr. Wilks to see the patient, with a view to the performance of an operation for the relief of the strangulation. The patch of dulness above Poupart's ligament was then rather more distinct, and, taking into consideration the previous existence of a hernia at this point, I thought it advisable to cut down upon and explore the inguinal canal and internal abdominal ring. There was no abdominal tenderness or tympanitis. Pulse 84.

Chloroform was accordingly given immediately, and an incision made about one inch above and parallel to Poupart's ligament, three inches and a half long, the centre corresponding with the internal abdominal ring. The various layers forming the abdominal parietes were incised upon a director, the external oblique, the united internal oblique and transversalis, and the transversalis fascia being distinctly recognised. The spermatic cord was seen at the lower part of the line of incision, and easily kept out of the way by a retractor, but the deep epigastric artery was felt pulsating in the wound, and some care was necessary to avoid injuring it. After cutting through the transversalis fascia it was clear that there was no inguinal hernia, and that the seat of obstruction was not at the internal ring, but that it was somewhere much more deeply placed. The resisting swelling could then be felt corresponding with the whole of this region, and on puncturing it a gush of yellowish serum escaped. Passing the finger in through the incision, numerous distended coils of intestine were felt, and on enlarging it, these were seen congested and of a dark colour, as in ordinary strangulation cases. Directing the finger *inwards*, the brim of the pelvis could be felt with the external iliac artery pulsating upon it; *backwards* the finger simply went in amongst coils of strangulated intestine; *externally*, however, a constriction could be felt evidently involving the bowel. This was placed about three inches from the internal ring, and in a direction somewhat upwards as well as outwards. The constriction was readily broken down with the finger, only one tough band requiring the use of the hernia knife, which was introduced carefully upon the finger. The bowel itself was not disturbed, the aim being simply to release the strangulation. The wound was then closed with sutures in the ordinary way, *not*, however,

passed through the peritoneal aspect of the incision. The carbolic spray (1—40) was used throughout the operation, the only care taken being to protect the intestines from the *direct* chilling action of the jet, a thing which in the present case it was not at all difficult to do, as they were never disturbed out of the abdominal cavity. A morphia suppository was applied after the patient had been placed in bed.

The recovery of this patient was rapid and complete. On the day after the operation he passed flatus freely; on the second day the wound was dressed and several of the sutures removed; on the fourth day he had a free action of the bowels, and all the sutures but one were removed. On the sixth day the last suture was removed; on the eighth everything appeared quite healed, and only a bit of dry gauze with the usual bandage was placed over the site of operation. On the eleventh day he was examined by Dr. Wilks, and by Dr. Rees, who happened to be paying a visit to the ward at the time. The wound was then perfectly healed, and appeared to be firmly consolidated. He had had an action of the bowels each day after the fourth day; had never had any pain or tenderness in the abdomen, the pulse, respiration, and temperature remaining throughout as nearly as possible normal. Two days after this he was ordered a light truss, with the pad made so as to support the whole length of the incision; this was considered advisable in order to compensate for any weakness of the abdominal parietes caused by the operation. Owing, however, to a considerable delay on the part of the instrument-makers, he did not get this fitted for many days, and consequently did not leave the hospital till January 24th.

Remarks.—The first question which proposes itself is, “What was the cause of strangulation in the second case?” Clearly nothing directly connected with the inguinal canal, for all the layers forming the abdominal parietes, including the transversalis fascia, were incised before reaching the bowel. I think the answer must be one of two things, viz., either (1) a strangulation caused by an adventitious band, or (2) this case is one of those described by French surgeons as “*réduction en bloc*.”

In favour of the former hypothesis we have the very large space in which the strangulated intestine lay, and the distance of the point of strangulation from the internal ring. The

latter hypothesis is more especially favoured by the fact, that there had been an inguinal hernia existing in that region before. The term "*réduction en bloc*" was first applied by French surgeons to a kind of accident occasionally met with, and which was believed to be due to the violent application of the taxis. For example, a patient with a hernia, suffering from all the symptoms of strangulation, comes under treatment. The surgeon attempts to reduce the hernia, believing that to be the source of the trouble. In the attempt he apparently succeeds,—the hernia disappearing,—but the symptoms of strangulation persist, and after death the bowel is found lying in a sac between the transversalis fascia and the peritoneum, still strangulated. This is the kind of accident which gave rise to the term, for it was believed that the surgeon in making use of the taxis had employed too great violence, and thus had forced sac and all in between the transversalis fascia and peritoneum, without in any way dislodging the bowel from the interior of the sac, and, consequently, without relieving the strangulation. But in process of time it came to be noticed in the post-mortem room that patients dying from quite other affections had occasionally a coil of intestine lying in a sac between the transversalis fascia and peritoneum in an unstrangulated condition, this being sometimes accompanied with a history of hernia, sometimes being without such a history. This discovery modified the views which surgeons previously held with regard to "*réduction en masse*." The tendency now is to say that it never takes place, that it is impossible, and that the so-called cases of such reduction are merely cases where the surgeon has pushed the bowel back into a second sac *previously existing* between the fascia and the peritoneum. The pendulum has in fact swung over to the other side, and we are inclined to deny the existence of what we before admitted. In this, as in other similar cases, the truth probably lies in the happy mean. No doubt such cases do occur; that has been proved conclusively in the post-mortem room. But I believe also that *réduction en masse* does occur, as supposed by its first describers, and that a likely cause for the formation of the "*ante-peritoneal hernia*" (as I propose to call those cases in which there is a sac lying between the peritoneum and transversalis fascia) lies in the ordinary reducing efforts made by a patient, the subject

of a fairly sized hernia. I have been led to this conclusion by noticing two things: 1. The violence to which a patient will often subject himself, to return a hernia, especially if it is at all inconvenient to him. For example, such a history as this is very common. A man at his work, the subject of a hernia, suddenly feels acute pain in his abdomen and groin. He knows from past experience that his hernia has come down in a way highly inconvenient to himself, and that if he can get it back he will be all right again. The pain and colic is so bad that he is obliged to retire into a private place, and there he attempts to reduce his rupture. Now the pressure which such a patient will put upon it is very considerable indeed; he has a most powerful inducement to make every effort to get it back; he knows that the instant he does so, his sickening pain will subside; and, in fact, he will do everything he possibly can to relieve himself—even to the extent of causing himself greater pain by the manipulation than the colic gives him;—because he knows that directly he has succeeded he will be happy. We must remember also that the skin is not yet rendered tender by repeated handling, as in the cases which come under the surgeon's care in hospital practice, and that consequently much freer manipulation is possible. . . . Again, it is my custom in the National Truss Society to make the patients return their own ruptures before ordering the truss, and I have been often struck with the degree of pressure which they *themselves* will apply, much greater than the surgeon could expect to do without putting them to pain. 2. In performing the operation of herniotomy, and in dissecting out herniæ in the post-mortem and dissecting rooms, I think every practical surgeon must have been struck by the fact that when all the layers over the sac down to the sub-peritoneal fascia have been incised, the sac itself in the great majority of cases is easily separable from the superficial layers,—a separability, no doubt, due to the looseness of the sub-peritoneal fat, a layer which represents the superficial fascia in the dermal structures. This separability is always recognised, and is indeed one of the essentials of success in such operations as ligature of the internal and common iliac arteries, where the aim is to separate the peritoneum from the abdominal parietes, so as to reach the artery without opening the peritoneal cavity. Often in per-

forming for myself such dissections I have been forced to admit how easy it would be, if the seat of strangulation were at the neck of the sac, to send the whole protrusion back into the abdominal cavity, by efforts at taxis, without setting free the strangulated intestine. In such a case, the sac would doubtless be forced into the abdominal cavity between the transversalis fascia and peritoneum, and then the question would arise at the post-mortem, "Was this sac previously existing, or was it formed by the efforts at reduction?" And each surgeon would no doubt answer the question according to his own preconceived notions as to the possibility of such an accident, or the reverse.

As before indicated, I propose to make use of the term "ante-peritoneal hernia" to these cases, in which there is a sac lying between the transversalis fascia and parietal layer of peritoneum. We already make use of the term "retro-peritoneal hernia," for those cases where the bowel slips into a sac on the posterior abdominal wall, generally behind the peritoneum covering over one of the mesenteric arteries; and, it seems to me, that the most apt term to describe the similar condition on the anterior abdominal wall, is the one mentioned above. The term might also be applicable to the cases described by Mr. Birkett, where the surgeon, by forcible efforts at taxis, ruptures the neck of the sac and forces a coil of intestine into the space between the transversalis fascia and peritoneum, but these cases differ from those to which I have been alluding, in that, in the one, the space is not lined by a layer of parietal peritoneum, in the other it is.

In the case under discussion, we shall probably (fortunately) never know what was the real state of affairs. The man got well, and as he has scarcely yet reached middle age, and is healthy and fairly robust, he is likely to have a long life in prospect. While performing the operation, having regard to the very large size of the space into which the finger passed, to the distance of the strangulation from the internal ring, and to the almost exact similarity of the case to that first described (upon which I had operated only a short space of time before), I came to the conclusion that the cause of strangulation must be probably similar. I am bound, however, now to state that, on a candid review of everything connected with the case, I think the

facts are so evenly balanced, that it is impossible to come to any certain conclusion. Dr. Wilks, in a clinical lecture delivered on the case, having regard to the previous history of hernia, also to the fact that fluid escaped in a jet, as if from a sac, when I opened the peritoneum, expressed himself strongly in favour of what I have called ante-peritoneal hernia. It must be observed, however, that fluid escaped in a precisely similar manner from the first case when the peritoneum was opened, and that here the cause of strangulation was proved post-mortem to be due to a band. It is probable in these cases that the fluid is poured out by the coils of bowel more immediately implicated; and as they become immensely distended by flatus, so that the whole abdomen becomes tight like a drum, that the fluid remains between the implicated coils, not finding it easy to diffuse itself among the remaining viscera. Probably, also, the mesentery, dragged up by the adhesion, may have something to do in circumscribing a kind of sac.

In relation to this case it is curious to note that, though there is a most clear history of inguinal hernia, the size of a hen's egg, coming down only three days before the operation, and for which he had worn a truss, yet at the operation no trace was found of any hernial sac. It could scarcely have escaped observation had it been there. If it was not there, it is evident that some of the arguments adduced against the possibility of "*réduction en masse*" are faulty. One of these arguments is, that the adhesion of the sac to the canal is so tight, that it *could not* be displaced. Another is, that if it were so displaced, the tearing would be so violent, that much pain and redness would be produced along the course of the inguinal canal. I have already indicated that I do not agree anatomically with the first of these arguments. And with the second, this case is in direct contradiction. The hernia had been down three days before, and yet no trace of the sac is discoverable, nor is any pain, redness, or inflammation along the course of the inguinal canal produced. There is another fact which militates against the second of these arguments. When an inguinal hernia is suddenly formed for the first time, no redness or signs of inflammation are produced along the line of descent of the sac. There is pain, it is true, but this is probably due to the stretching of all the parts, and to the pressure on the bowel. This is proved

by the fact, that directly the bowel is reduced, the pain ceases. It seems probable, therefore, that as a sac may come down without any sign of inflammation, so it may be returned without any such signs.

Treatment.—I cannot myself help feeling, taking a candid review of the circumstances in Case 1, that had I operated when first called to see the patient, instead of trying other and futile measures, I might have had as happy a result in this as in the second case. From the previous history, however, the diagnosis was considered to be almost certainly strangulation from a band. Gastrotomy is not a favorite operation with surgeons for the relief of internal strangulations, and after a consultation we decided to delay the operation and try manipulation, to see whether we could not break down the adhesions and thus release the strangulation. There can be no doubt that this, as well as the treatment by injections, did harm by aggravating the peritonitis and hastening the fatal ulceration of the intestine at the seat of stricture.

I would advance the facts in these two cases as a plea for early operative interference in such patients. As a rule, the case is left to the last gasp, and then surgeons point to the excessive mortality as tending to show that operation is unjustifiable. The argument for early operative interference becomes excessively strong in cases such as the two just described, where some fact pointed positively to the groin as being the place for making the exploratory incision. But even in cases where such fact is absent, I should think it right to make an incision into the middle line of the abdomen, and, passing in the hand, to explore carefully from within, first the internal abdominal rings of either side, and if nothing be found there, then to feel carefully amongst the coils of intestine for a band or any permanently constricted portion of the gut which might tend to point to the existence of volvulus. Intussusception has definite symptoms of its own, and is generally diagnosed without the aid of an exploratory incision, but the propriety of surgical operation in certain cases of this affection has recently been advocated by Mr. Jonathan Hutchinson, and with his conclusions in this respect I cordially agree. Of course it will be understood that I do not advocate ventral section for those cases of obstruction

in which the large intestine below the ascending colon has been proved to be the seat of tumour, &c., or in which such mischief is even probable. For these cases colotomy will always be the proper operation, being, according to our present experience, much safer than ventral section. But for those obscure cases of strangulation, where the obstruction seems to be placed in the small intestine, I not only believe that it is justifiable, but that it is the proper and right thing to do. Some years ago I sat with a patient who died from intestinal obstruction; and I shall never forget the intense agony he suffered during the ten days of his illness, nor the way in which he begged the surgeons in attendance to do *anything* in the way of operation or otherwise to relieve him of his distress. They did not, however, see their way to doing anything surgically, and the patient was simply placed under the opium treatment. At the post-mortem examination it was found that the obstruction was caused by a band due to a former attack of peritonitis. I was present at the examination, and could not help seeing, though at that time with inexperienced eyes, that the band might readily have been divided if ventral section had been performed.

Undoubtedly it will be only a small proportion of cases which we shall be able to save even by this operation. But even if the worst happen, what takes place? We hasten by a few hours the fatal result; we cut off a few hours of misery and pain from a life which is already doomed. Will anybody say that this is unjustifiable, bearing in mind the object we have in view in the performance of the operation? I will cite, as an example, the case of a man, who was admitted, shortly after the second of my two cases narrated above, into Clinical Ward under the care of my colleague Mr. Davies-Colley, suffering from obscure symptoms of obstruction. There was fæcal vomiting, severe and persistent, and pain in the abdomen, especially on the right side, but the obstruction was not complete, small quantities of fæces having passed once or twice since the symptoms commenced. This, however, might be accounted for by supposing that only a portion of the calibre of the gut had been caught in some constriction. The inguinal canals were clear, but it was thought that a lump could be felt on the right side of the umbilicus. After a consultation together, Mr. Colley decided upon cutting down in the median line of the abdomen, and

seeing, or perhaps I should rather say *feeling*, whether anything could be done for the patient. This was accordingly done, a small incision being made opposite the umbilicus in order to take the opportunity of exploring a small hernia which existed there. Nothing was found in it save omentum, and the hand was accordingly passed into the abdominal cavity through the incision, the whole extent of which it filled, so as to exclude air, &c. The region of the inguinal canals was first explored, but nothing found there. Scarcely, however, was the abdominal cavity opened before a strong fæcal odour became apparent to those standing near, and it was thus evident that fæcal extravasation had already taken place. The seat of mischief was very speedily found by Mr. Colley in the right iliac fossa, where there was a knotted mass of what at first appeared to be new growth, and beneath this liquid fæcal matter. Under these circumstances it was clear that all attempts to save the patient's life would be futile, and the incision was accordingly closed. As might be expected, the patient only lived about three hours after the operation. At the post-mortem the knotted mass turned out to be matted omentum, and the cause of all the mischief was ulceration taking place in the bowel close by the appendix vermiformis, apparently from some concretion getting lodged there.

This was perhaps as bad a case as could possibly fall to the surgeon's lot to operate upon. But after all, what was done here? The patient's death was hurried by a few hours. A short space of misery was spared him. Will anybody say that the surgeon was not right in doing this? I opine not. More than this; will anybody say that, because the majority of these cases depend upon causes which must necessarily prove fatal independently of any operation, that, therefore, the surgeon would be justified in refusing the patient the faint hope of life that remained? Again, I opine not. Such a view might be entertained by one who consults mainly his own statistics of results; certainly not by one who regarded the relief of suffering humanity as one of his primary professional duties.

But it is objected to these operations. (1) That some of the cases will get well of themselves. (2) That the operation itself is such as to cause death in many cases, even in a state of health.

With reference to the first objection, I may remark that the number of cases of organic obstruction in which the patient by the natural methods gets well is excessively small. I can myself only call one case to mind out of all those that I have seen in the wards of Guy's Hospital. This was a lad, aged about 15 years, under the care of the late Dr. Barlow. He was placed under the opium treatment, and, after a prolonged illness in which there were marked symptoms of peritonitis, recovered perfectly. This being one of the earliest cases of obstruction that I ever saw, left a deep impression on my mind, and influenced me strongly, I have no doubt, in favour of that particular mode of treatment. But since then a long succession of fatal results has convinced me how futile the treatment generally is. Indeed, in looking back to that one case, I do not feel certain now, with the greater experience that I have upon the subject, that it ought to be included amongst those of organic obstruction. The opium treatment was commenced very early, and most probably, by the constipation which it gives rise to, prolonged the apparent obstruction, which may have arisen from some temporary cause, and not from any organic impediment. Indeed, in any such case, opium ought to be given with very great caution. As in hernia cases, it gives a feeling of false security to the patient, and thus often delays the necessary operation beyond the time when it will be of avail. After its administration, the severe colicky pain ceases, the patient sleeps, and, feeling relieved from the severity of his distress, fancies that he is better. But this relief is only temporary, and then when the symptoms return in all their virulence, he is in far worse a condition for operation than he was before. This fact is now well recognised by surgeons in hernia cases, and ought also to be recognised in those of internal obstruction. As an example, I may refer to the first of the two cases narrated in this paper.

With respect to the second objection, there can be no doubt, that in past times it was a perfectly valid one. But it seems to me that, since the introduction of the antiseptic spray, we gain such safety in opening the peritoneal cavity, that it is not an objection which ought to have weight with any one experienced in its use. I make this statement upon the basis of my results in hernia cases, and other operations in which the abdominal

cavity has been opened. The principal precautions to be taken are, (1) not to allow the spray to play directly upon the surface of any intestine which may be exposed. (2) To have a large piece of flannel or lint ready, dipped in hot carbolic lotion, so as to throw over any exposed loop of intestine. (3) Not to permit lotion in any quantity to flow into the peritoneal cavity, and if accidentally it does flow in, to sponge it out immediately. (4) To have the spray as hot as it is possible to get it. And, of course, all the established precautions of antiseptic surgery, such as warm carbolized sponges, antiseptic sutures and gauze, must be used. The reason of precautions Nos. 1, 2, and 4, is to avoid the cooling influence of the spray upon the very thin vascular membrane which forms the intestine. This cooling influence is so great, that it seems to me it might very readily destroy the vitality of such a thin animal membrane; and thus cause speedy death by collapse after the termination of the operation. Precaution No. 3 is taken to avoid the absorption of large quantities of carbolic lotion into the circulation, and partly to avoid as far as possible the irritant action of the acid upon the peritoneum. I have no doubt that it does cause some slight irritation, and in cases of extreme exhaustion, this might prove the last straw which breaks the camel's back. But this risk is not in the slightest degree comparable to that which is caused by the introduction of septic materials from without.

I think then that the consideration of risk from the operation ought not in any case of well-proved organic obstruction to deter a surgeon, versed in the employment of antiseptic methods, from the operation recommended here.

1

ON

EXTRACTION OF CATARACT.

By C. BADER.

INTRODUCTORY REMARKS.

To teach students the performance of operations on the living eye is one of the most difficult duties. Responsible for the patient's sight, and ignorant of the student's capabilities, the surgeon anxiously has to feel his way while assisting the student at an operation; he has to select such modes of operating as will secure benefit to the patient and facility of performance to the student. These circumstances have influenced my method of operating for cataract; had it not been for the necessity of instructing students, I should never have become so perfectly independent of all assistance, as the mode of operating, now to be described, enables me to be. Fixing the eyeball with forceps, or, worse still, allowing an inexperienced assistant to do so, introducing a scoop into the eye, making the incision too near the margin of the cornea, &c., have, even in experienced hands, been the cause of the loss of sight. How much more often must this occur at a medical school, where assistants have to be changed—to give others the opportunity to learn—and where, before trial, new assistants cannot be relied upon.

The consequence of this was that I was forced into a mode of operating for cataract which, though in many cases not produc-

ing such a good-looking eye as other methods may do, certainly, as regards restoration of useful sight, can be recommended.

Dr. Liebreich, ophthalmic surgeon to St. Thomas's Hospital, in the reports of that hospital, describes a method of removing cataract which, as far as making the incision in the lower half of the cornea goes, is very similar to the one practised at Guy's. Some years ago Dr. Liebreich repeatedly visited the eye department of Guy's Hospital and witnessed this and other methods of removing cataract. I stated to him at that time that extraction "downwards" was the usual method. After having read Dr. Liebreich's paper, I requested him to state in what his operation differed from the one he had seen at Guy's. In a note to me he stated that he did not remember the details of my method of operating, so he could not pronounce as to the differences. Thus it appears that Dr. Liebreich arrived at a similar mode of operating by scientific reasoning at which I arrived by an instinct of self-defence. My operation, as regards manipulation, instruments, &c., differs in many respects from the one described by Dr. Liebreich.

THE OPERATION.

I shall describe the operation as performed on a patient with ripe cataract without complications, and not under the influence of an anæsthetic, giving in foot-notes such deviations from the regular operation as may occur, according to the different nature of the cases.

A favorable time for the operation, especially if an anæsthetic¹ is given, is the morning (breakfast to follow the operation).

¹ The anæsthetic. Chloroform is preferable. It is given in cases in which the behaviour of the patient—spasmodic closure of the eyelids, when gently touching the eyeball, violent muscular efforts during the first steps of the operation—render probable a great strain upon the eyeball during the operation. Of the two, I prefer sickness after the operation (from the anæsthetic) to violent straining during the operation.

All preparations for the anæsthetic should tend to avoid sickness. Old people, after a night's rest and before breakfast, take chloroform well, as a rule. The patient must be thoroughly under its influence before completing the corneal incision. In case of sickness, after the eyes have been bound up, the hand should be placed on the bandage over the operated eye, to support the latter by gentle pressure.

The patient remains in bed. The bed is placed so that during the operation the patient faces the light. The surgeon stands behind the patient, whose head is slightly raised.

The surgeon keeps the eyelids open¹ (for the right eye with the left, for the left eye with the right hand) by placing the tip of the index finger on the margin of the upper eyelid, near the inner canthus (see Fig. 4), thus keeping open the upper eyelid; the tip of the middle finger rests against the eyeball at the inner canthus (see Fig. 4), thus steadying the eyeball² and simultaneously depressing the lower eyelid. This manipulation, with care, suffices to keep open the eyelids and to steady the eyeball while completing the incision.

The Incision.—Fig. 4 represents the position of the hand and knife, after completing the counter-puncture, while operating on the left eye. The greatest horizontal diameter of the pupil must be the guide as to the position of the puncture and counter-puncture.

The knife is thrust through the sclerotic, close to the margin of the cornea, into the anterior aqueous chamber, at a point where a prolongation of the horizontal diameter of the pupil would pass through the junction of the cornea and sclerotic; the knife is carried quickly (*to avoid losing aqueous humour*) across the aqueous chamber in front of the iris, and thrust out at a point horizontally opposite the puncture. Having quickly made puncture and counterpuncture, we slowly cut forwards towards the surface of the cornea,³

¹ Whether to use a speculum to keep open the eyelids is left to the judgment of the surgeon. A stop-speculum (Fig. 2) can be recommended. Pressure upon the eyeball must be avoided as much as possible. As soon as the corneal incision is completed or, if possible, after making the counter puncture, the speculum should be removed, and the operation be completed by manipulation of the eyelids with the fingers only.

² Steadying the eyeball, if a speculum is used, is done with the screw fixer (Fig. 2) placed just above the spot where we propose making the counter puncture. It is laid aside as soon as the counter puncture is made. When fixed in the sclerotic, it acts as a guide to the point of the knife in making the counter puncture.

³ If Von Graefe's knife is used, a smaller angle is described when turning the knife to complete the incision, and more pressure is made on the parts next the back of the knife. This is much less the case with the grooved cataract knife (Fig. 10); it gives a wider base to the incision, and if dexterously used, does not allow the aqueous humour to escape too soon.

and slowly complete the incision. The result should be a line of incision of a shallow curve, the point of its greatest convexity to be opposite the lower margin of the pupil.

Before completing the incision, the patient must be urged to breathe with his mouth open, and to abstain as much as possible from any muscular efforts. Straining, on the part of the patient, is less dangerous, as long as the aqueous humour has not escaped. It always increases the blood pressure within the eyeball. Once the aqueous humour has escaped, the liability to rupture of the suspensory ligament of the cataract, or to loss of vitreous, bleeding between choroid and sclerotic, displacement of choroid, &c., increases.

Opening the capsule.—The manipulations are the same as in other methods for removing cataract, and are very much facilitated by the incision in the lower half of the cornea. Let the eyeball “turn upwards” as much as it will; the capsule can still be opened. Care should be taken to lacerate the capsule most freely along the lower margin of the cataract. I use a sharp electro-gilded hook instead of the usual pricker; it lacerates the capsule with greater certainty; tough pieces of capsule, and sometimes the cataract itself, can be withdrawn from the eye. If the sharp hook becomes fixed in the cataract, as may be seen by the cataract following the movements of the hook, the latter must be carefully withdrawn; this very movement of the cataract shows that it is sufficiently freed for escape by manipulation with the fingers. A little care will prevent the hook being caught in the cornea or iris.

Removal of the cataract.—Removing the cataract by manipulation with the fingers only, has for a long time superseded the use of the scoop or of other instruments. It succeeds if the incision is made in other parts of the cornea, but best if it is made in the lower half. The very movement of the eyeball upwards, so trying to the surgeon in other methods of operating, is a help to him in this.

The anterior capsule having been lacerated, the patient, keeping the eyelids closed, is allowed to rest for a minute; he is then directed to open the eyelids gently, while with the finger of one hand we gently press the margin of the lower eyelid upon the eyeball near the lower margin of the cornea, thus loosening and displacing the cataract from behind the iris

towards the incision. While the lower eyelid is gently pressed upon the eyeball, the upper one is carefully raised by the tip of the index finger of the other hand, along the surface of the eyeball, until the margin of the upper eyelid has passed a little beyond the upper margin of the cornea; then, by gently pressing the margin of the upper eyelid upon the eyeball, the upper margin of the cataract within the eye is pushed backwards towards the vitreous chamber, while the lower margin of the cataract advances from behind the lower margin of the pupil into the corneal wound.

The pressure upon the upper aspect of the eyeball, through the upper eyelid, should be more gentle. Once about one third of the circumference of the cataract has escaped by the corneal wound, the rest of the cataract readily follows on gentle pressure.

Loss of vitreous.—Among hundreds of cases this accident has occurred to me four or five times only (including cases of liquid vitreous). Removing the cataract by manipulation with fingers only, without the use of a scoop, together with the situation of the corneal incision, are the causes of the small percentage of loss of vitreous. The aqueous humour having escaped, the elasticity of the vitreous substance and the blood pressure in the choroid make themselves felt. The cataract, a hardish substance deprived of elasticity, together with the iris, is pressed forwards upon the cornea. The delicacy and the nature of the manipulations to effect the escape of the cataract depend upon our knowledge of the relative positions and of the physical properties of the parts we have to deal with. Too great pressure upon the eyeball, to displace the cataract, may give rise to rupture of the suspensory ligament, and to displacement of the cataract. The lower half of the pupil becomes clear—black—suddenly. Careful pressure of the eyelids upon the eye near the upper margin of the cornea may succeed in pushing the cataract from behind the iris into the corneal incision. If vitreous escapes during or previous to this manipulation, a scoop (Fig. 11) should be passed into the vitreous chamber behind the cataract, with the object of removing the cataract from the eye. The rule is: whatever the vitreous do, remove the cataract. If the iris be tremulous, or the suspensory ligament of the lens weak, as in the myopic

eye, with brown large hard cataract, we avoid escape of vitreous by making the incision near the middle of the cornea, leaving thus a large piece of cornea to support the vitreous substance.

Vitreous substance shows an inclination to escape if the iris protrudes into the incision before or after removal of the cataract, or if the pupil suddenly becomes "black." Once the hard part of the cataract is removed, it is better to leave some of the soft cataract in the eye, or to leave the iris protruding from the incision, than to loose vitreous substance. The former, during careful after-treatment, becomes absorbed, the latter often recedes, when once the tension of the parts within the eye has returned to the normal; while, if vitreous has been lost, a more serious succession of troubles must be looked for.

After-treatment.—Having removed the hard part of the cataract, and as much of the soft part as will escape readily by the manipulation employed in removing the hard part, we bind up both eyes so as to exclude light and keep the eyelids closed. One or several pieces of wet lint are smoothly and carefully placed upon the closed eyelids of each eye, keeping the lint in position by a very porous linen bandage (made for this purpose). The bandage should not cause a painful sense of pressure or interfere with the rest of the head. One of the attendants must be shown how to let water soak through bandage and lint without disturbing either. The lint may require to be moistened every hour (whilst the patient is awake), or more often if the eye feels hot or painful, especially in the evening or after meals.

Both eyes are kept bound up and cool for three days after the operation, or longer if using the sound eye causes pain in the other. Whether to keep the lint dry, or wet with cold or tepid water, depends (1) on accidents which may have happened during the operation (if much soft cataract has been left in the eye, the lint may have to be kept very cold and wet for several days); (2) on the general aspect of the patient, for instance, very old persons, especially if the cornea collapses after escape of the cataract, require the lint moistened with tepid water at once after the operation; (3) on the patient's statements after the operation as to pain, sense of heat, &c. When the eyelids have resumed their natural colour, and all pain has ceased, dry lint is

used to keep the operated eye bound up with until nearly all redness of the eyeball has subsided.

As to leeching, interference with prolapse of iris, corneal complications, the rules hold good which are in use for other modes of removing cataract.

The patient is kept in bed for twenty-four hours consecutively after the operation.

Turning in of the lower eyelid of the eye operated on does occur rather frequently, probably from irritation of the adjacent corneal wound. The position of the often very relaxed eyelid must be watched and rectified, if abnormal, by carefully adjusting the bandage. If, on the third day after the operation, the milder means to obviate entropion do not succeed, an operation (removal of some tarsus, &c.) should be resorted to. Serious troubles with the corneal wound, abnormal increase of tension, iritis, &c., are avoided by early interference.

When not to perform iridectomy :

1. In all cases of ripe cataract without complications (whether senile, traumatic, or congenital). The cataract is termed ripe if the anterior surface of the crystalline lens is opaque along the inner surface of its capsule.
2. When the crystalline lens is hard throughout (not gelatinous). (It may be transparent and yet hard throughout, as in many myopics, and in persons who have suffered from inflammation, especially syphilitic changes, of the eye.)

When to perform iridectomy :

1. In all cases of unripe cataract, *i. e.* in which the optic disc is more or less visible.

Many unripe cataracts, and also hard, transparent lenses, have successfully been removed without iridectomy ; it is, however, safest to precede the removal of an unripe cataract by iridectomy.

2. If complications are likely to arise from the iris (such as rigid, contracted pupil, resisting atropia, iris adhesions, &c.); or from the lens capsule (such as white, fibrous deposits upon the capsule).

3. When the tension of the eye is increased, however slight that may be.

4. When a better insight into the state of the vitreous chamber is required.

5. When the patient, very nervous and restless, refuses to take an anæsthetic. In these cases an iridectomy pupil is a great boon.

The iridectomy is made vertically downwards, and the cataract removed *only* after all irritation from the iridectomy has subsided (in from one to twelve weeks).

DESCRIPTION OF PLATES,

Illustrating Mr. Bader's Paper on Extract of Cataract.

PLATE I.

Fig. 1. The cornea, iris, and cataract. The slightly curved line across the cornea, along the lower margin of the pupil, represents the size, shape, and position of the incision for the removal of ripe cataract.

Fig. 2. The incision for removal of unripe cataract in an iridectomized eye.

Fig. 3. The incision for removal of congenital cataract.

Fig. 4. Shows the position of two fingers of the right hand, while keeping the eyelids open, and of three fingers of the left hand holding the knife (the position of the thumb is correctly represented, that of the first and second finger is wrong; only the tips of the finger-nails should be shown, the knife resting on the inner surface of these two fingers).

The position of the puncture and counter-puncture are correctly represented.

Fig. 5. The left eye after completing the incision.

Fig. 6. The left eye during escape of the cataract by manipulation.

The finger placed upon the lower eyelid has ceased pressure, while the finger on the upper eyelid, by pressing the margin of that eyelid upon the eyeball near the margin of the cornea, causes the cataract to escape through the incision.

PLATE II.

Fig. 1. Stop speculum to keep open the eyelids with the least possible pressure upon the eyeball. This speculum differs from the one originally brought to Guy's, by the part, which is placed beneath the eyelids, being much shorter. The eyelids are less put on the stretch, and less pressure is made upon the eyeball. The speculum is used if the patient offers much resistance to the touch with the fingers, or if the eyeball is very small and deep-seated.

The speculum and the iris scissors, Fig. 9 (the invention of an American medical man), were brought to Guy's Hospital by Dr. Noyes, of New York, U.S.

Fig. 2. Screw fixer, to fix the eyeball while making the puncture and counter-puncture; it should be screwed into the sclerotic, close to the margin of the cornea, just above the spot where the counter-puncture is to be made. It causes less pain than the forceps, and is very secure.

Fig. 3. Straight, lancet-shaped knife.

Fig. 4. Bent, lancet-shaped knife.

In 3 and 4, at some distance from the point, the cutting edges become parallel, so that, passed into the aqueous chamber, the corneal incision at the outer surface is as wide as at the surface next the aqueous chamber. A linear incision of good width is obtained. 3 is used to make the incision in the lower or in the outer half of the cornea; 4, to make the incision in the inner or upper half. 3

Description of Mr. Bader's Plates—continued.

and 4 were made for me in 1864, but were given up when 5 (Von Graefe's knife) was introduced; this, lately, has been followed by 6, a grooved cataract knife, the object of which is to complete the corneal incision without (or but very little) changing the direction of the knife after completion of the counter-puncture.

Fig. 7. Iris forceps, for iridectomy or for removal of lens capsule. The mechanism of closing the forceps is more simple than the one introduced by Dr. Liebreich. For removal of the entire iris, or of tough pieces of capsule, an electro-gilded forceps with long, sharp teeth is found of very great use.

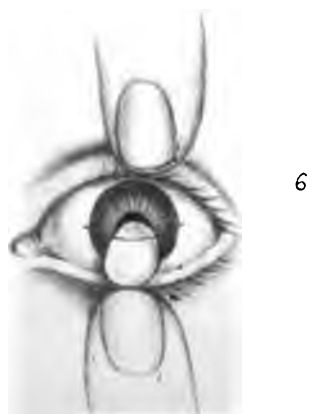
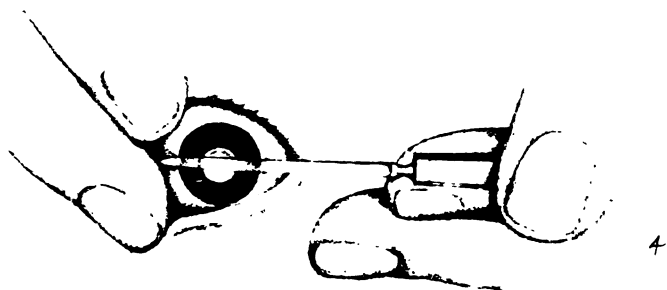
Figs. 8 and 9. Iris scissors, for iridectomy. 8 is preferable to 9. It can be used with the same ease by the right or left hand.

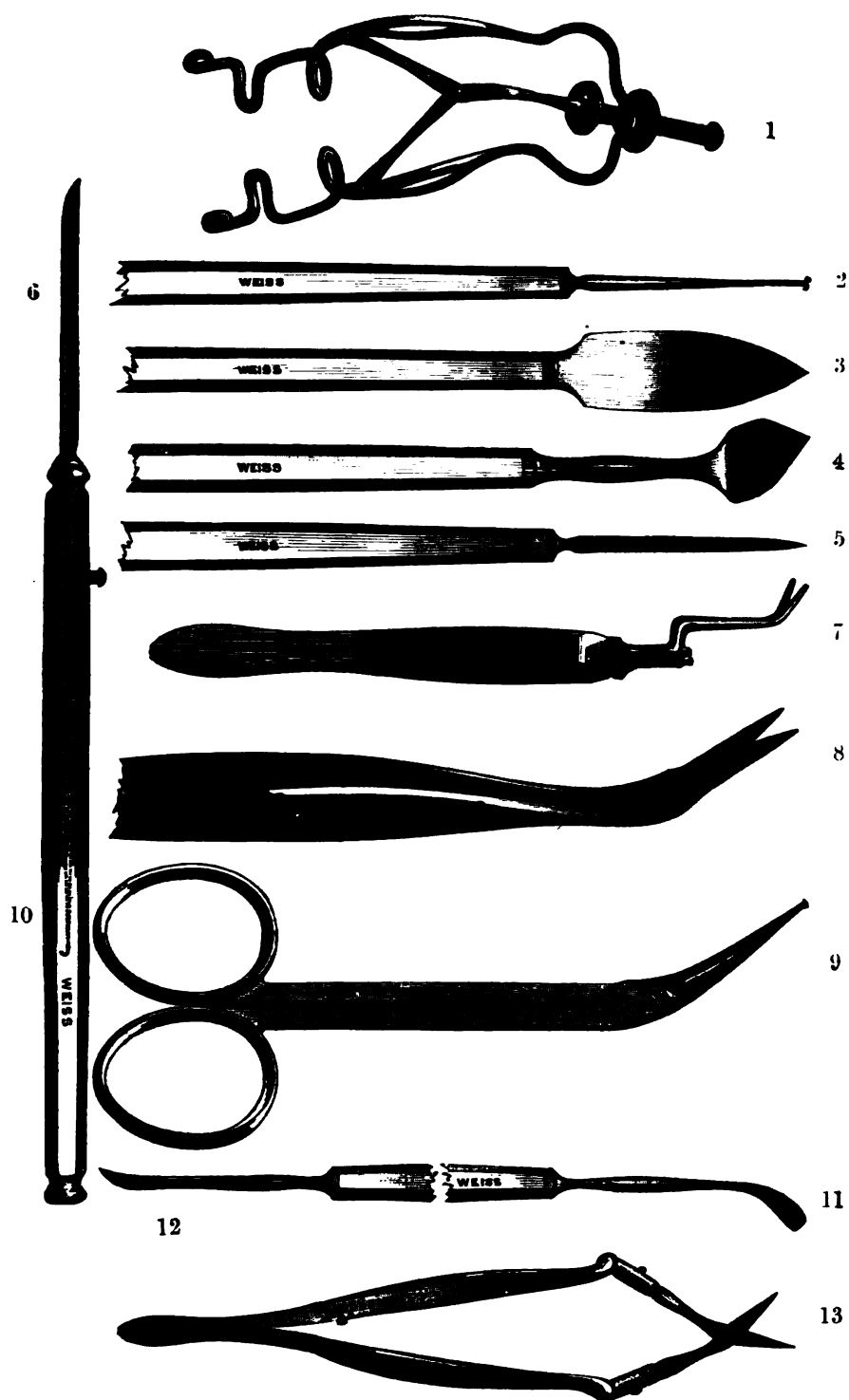
Fig. 10. Sharp, electro-gilded hook, for lacerating the lens capsule, for extracting pieces of capsule, occasionally for removing the cataract, &c.

Fig. 11. Scoop for removing portions of cataract.

Fig. 12. Scoop for replacing the iris.

Fig. 13. Capsule scissors, for cutting through tough pieces of capsule, or of iris and capsule. The longer blade is blunt and electro-gilded.





ON THE
DETECTION OF BLOOD BY GUAIAIACUM.

By ALFRED S. TAYLOR, M.D., F.R.S.

IN the 'Guy's Hospital Reports' for 1867 and 1870 I have made some remarks on the detection of blood by the use of guaiacum and peroxide of hydrogen or antozone in medico-legal cases. In the 'Reports' for 1867, p. 453, it is stated that "tincture of guaiacum appears to lose its properties when long kept, probably as a result of exposure to light and air at the same time." Dr. J. Day, of Geelong, Australia, has lately communicated to me (January, 1874) the results of some experiments on this subject, and on the production and presence of antozone in a variety of substances in which it would not be suspected to exist.

The application of this test requires the admixture of three substances—an alcoholic solution of guaiacum resin, a solution of pure peroxide of hydrogen in ether, and a solution of the red colouring matter of blood, either new or old. Under these circumstances the resin acquires a rich blue colour, as it is believed, from oxidation. Any precipitated resin is dissolved by the addition of alcohol or ether, forming a deep blue solution. No other red colouring matter gives these results; but Dr. Day has found that pus operates in a similar manner when substituted for the red colour of blood, and he has employed the peroxide with guaiacum as a test for pus.

The tincture of guaiacum, when long kept, undergoes changes which render it unfitted for use. An old tincture mixed with peroxide of hydrogen, sometimes fails to produce any change of colour in blood. This was pointed out in a former paper ('Reports,' 1867, p. 453), and a method of detecting this chemical change suggested. Before employing the guaiacum on any suspected colouring matter, it should be added to a small quantity of the colouring matter of fresh blood with and without the addition of peroxide. If fit for use this will be indicated by the blue coloration of the resin being produced only after the addition of the peroxide.

Dr. Day has noticed another change in the guaiacum resin when it has been exposed to light and air, which may mislead one who does not employ proper caution in the application of the test. He finds that tincture of guaiacum, under the conditions above mentioned, is liable to produce or take antozone from the air. Thus, when such a tincture is added to a solution of blood, a blueing of the resin takes place at once. The addition of peroxide is not required, as this already exists in sufficient quantity in the tincture. Seeing that there are many substances which cause this change of colour by direct contact with tincture of guaiacum, all analysts who have employed this test have taken care to add the tincture of guaiacum to the suspected liquid or stain before using the peroxide. If the blueing took place the test was withdrawn, and some other process for detecting blood was resorted to. The fact that antozone may spontaneously exist in the tincture, therefore, forms no objection to the test, provided the tincture is first applied to the liquid or solid.

It is advisable, in all medico-legal cases, to make a fresh solution of the resin in alcohol, selecting the inner or unoxidized portions of resin for this purpose.

When kept in the dark, in a small bottle closely corked, the guaiacum solution will retain its properties for a long time. I have just received from Dr. Day, in Australia, two samples, one bottle being covered with a coat of black varnish, the other, a larger bottle, which has been exposed to air and light. The former gave the proper reaction with blood only on the addition of peroxide; the latter contained a sufficient quantity of peroxide to acquire a blue colour at once when

treated with a solution of the red colouring matter of blood. It was, therefore, not fit for use.

A great number of liquids have the property of absorbing from the air or producing antiozone or peroxide of hydrogen. Thus, it has been found by Dr. Day and by myself in some samples which he has sent to me, in alcoholic solutions of essential oils, in Eau de Cologne, and in numerous hydrocarbons, such as kerosene, benzole, and other similar products. Dr. Day has also found it in the oils which absorb oxygen from air and in different kinds of fats exposed to air, and he believes that important physiological considerations may follow from this diffusion of antiozone among these fatty substances.

The only forms in which antiozone can be employed as a test for blood is in its combination with ether or oil of turpentine. The former is preferable.

A CASE OF DIABETIC COMA.

By FREDERICK TAYLOR, M.D.

WITHIN the last few days a case of diabetes has been admitted under my care, in which an opportunity occurred of trying the method of treatment suggested and carried out by Dr. Hilton Fagge, and recorded by him in the earlier part of this volume.¹

The patient was in an exhausted state when she came into the hospital, and was passing large quantities of sugar. She was shortly placed on a restricted diet, and in a few days the urine had decreased to less than half, and the daily excretion of sugar to less than one fifth of that observed on admission. She then became rather drowsy, but recovered somewhat the day following, March 5th.

On March 6th, after walking up the ward, and complaining of pains all over her, she sank rapidly into a state, not of simple coma, but one in which this condition was combined with collapse. Dr. Fagge, who saw her about this time, states that her condition was very similar to that of his patient who was revived for a considerable time by the injection of a warm saline solution into the blood-vessels.

The result in my case was very much less satisfactory. For a short time the colour returned to her lips and cheeks, the pulse beat with fair force, and the temperature in the axilla rose $1\frac{1}{2}^{\circ}$ Fahr., namely, from $95\cdot2^{\circ}$ to $96\cdot7^{\circ}$; but the improvement

¹ P. 173. "A Case of Diabetic Coma, treated with Partial Success by the Injection of a Saline Solution into the Blood," by C. Hilton Fagge, M.D.

was only temporary, and she died two hours after the termination of the operation.

I have said that the condition in which death took place was not one of unmixed coma, but it was at least similar to that in which the same treatment had been partially successful.

Moreover, if such a method is fairly based upon the view that in diabetes there is an unusual drain of water from the system, then it should be applicable to such a case as the present, where the patient died of diabetes, and not of any visceral complication, such as phthisis, for one can hardly regard the granular condition of the renal epithelium, or the distension of the colon, as sufficient causes of the rapidly fatal termination.

The fact remains that the treatment was here decidedly unsuccessful; not that the end was thereby hastened, but it was probably delayed only in proportion to the warmth imparted to the body, and the stimulation to which the heart was subjected by the temperature and the quantity of the fluid employed.

The following notes are from the report of Messrs. W. H. Lamb and E. O. Giblin:

S. B—, æt. 22, was admitted February 27th, 1874. The patient is a paper-bag maker, and has had measles, smallpox, and whooping-cough, as a child; since then she has enjoyed good health. Her first child was born sixteen months ago. She menstruated for three months after her confinement, but not since.

Last October she suffered from malaise, was unequal to her work, and noticed that she was losing flesh. The symptoms became more marked, and two months ago she observed that the quantity of her urine was considerably increased.

She is a small, spare woman, with fair complexion, light hair, bright, clear eyes. She is very much emaciated and the skin is dry, especially under the left mamma and on the outer aspect of each arm. She does not perceptibly perspire.

The tongue is pale, the appetite good, and she is very thirsty. The bowels are confined, the abdomen full and resonant. Hepatic dulness extends just below the ribs; the spleen, lungs, and heart are normal.

The urine is abundant, of a pale straw colour, slightly acid,

of specific gravity 1040, contains a little albumen and a large quantity of sugar.

Pulse 82, full and compressible; resp. 16; temp. 99·1° Fahr.

On the day after admission she was ordered as diet, chop, beef tea, greens, gluten bread, two ounces of milk, soda water.

On the 1st March she weighed 6 st. 2½ lbs. The urine of the previous twenty-four hours measured 7½ pints, had a specific gravity of 1040, contained no albumen, but 6000 grains of sugar.

2nd.—Slept very little last night; is very weak and exhausted. Tongue furred, brown in the centre, red and dry at the edges. She complains of great thirst, is in no pain. Bowels confined. Pulse 112; resp. 24; temp. 97·1°.

3rd.—Bowels opened after an injection. She drank less yesterday. The tongue is cleaner; she is still weak, and takes as food a chop, greens, a slice of gluten bread, half a pint of beef tea, and some water. The urine contains a slight amount of albumen, and less sugar. Pulse 96; resp. 18; temp. 97·9°.

4th.—She is somewhat better this morning, does not drink so much as before, but takes her food badly. She has had to-day part of a chop, a small slice of gluten bread, some greens, half a pint of beef tea, and two ounces of milk. At the visit in the afternoon she was rather drowsy and listless, only answering in monosyllables, and not seeming to take interest in things about her; in the evening at 9 o'clock she was brighter and less sleepy.

Ordered Mist. Mag. c. Mag. Sulph. ʒj bis die.

5th.—Is less drowsy; has passed more urine and sugar.

6th.—Temp. 96°; pulse 132, very weak. She got out of bed and walked up the ward, complaining that she was in great pain all over; hot poultices were applied to the abdomen without much relief, and at half-past eleven she was lying in bed with closed eyes and dilated pupils, not easily aroused to answer questions, and breathing heavily with loud moaning expirations. The abdomen was very full, but not tense. One minim of croton oil was ordered immediately; her condition, however, became worse, and at 1·30 p.m., after consultation with Dr. Fagge, it was determined to inject a saline solution into the veins.

One of the veins of the left arm was opened by Mr. Hetley, house surgeon, and a solution of phosphate of soda and chloride of sodium, of sp. gr. 1030 and temperature 100° Fahr., was allowed to flow in slowly. The injection was commenced at 11 minutes past 3, and occupied 33½ minutes.

Before the commencement the patient was cold, the pulse 116, only just perceptible, temperature in the axilla 95·2°. After 5 minutes, during which 9 ounces had been injected, the pulse was 144 and stronger. After 8½ minutes the lips had gained colour considerably, and about this time she spoke and asked for tea. After 11 minutes the temperature had risen to 96·7°. After 21 minutes the cheeks were slightly flushed and warmer, the pulse 140. After 25 minutes the temperature was 96·3°, and she had again become restless, moaning and crying out. The injection was discontinued when it had reached 30 ounces.

At four o'clock, fifteen minutes after the end of the operation, the temperature was 96·4°.

She gradually sank, and died at 5.40 p.m.

The daily condition of the urine was as follows :

	Quantity.	Specific gravity.	Quantity of sugar in grains.
March 1 . . .	7 pints, 10 ounces . . .	1,040 . . .	6,000
" 2 . . .	7 " 4 " . . .	1,035 . . .	3,456
" 3 . . .	4 " 4 " . . .	1,030 . . .	1,344
" 4 . . .	3 " 4 " . . .	1,026 . . .	1,102
" 5 . . .	5 " 18 " . . .	1,030 . . .	2,360
" 6 . . .	5 " 6 " . . .	1,030 . . .	1,206

The following notes are from Dr. Fagge's report of the post-mortem examination, made on the 7th March :

Diabetes, Collapse, and Coma.

S. B—, æt. 22. The brain weighed forty ounces, was dry-looking, and very firm; the cineritious substance of a very dark colour; the arachnoid and pia mater were much congested, the vessels being very minutely injected, but not turgid.

The pons Varolii appeared quite normal, its structure being particularly distinct.

The lungs were healthy, and a fair quantity of frothy liquid flowed from their cut surfaces.

The heart, liver, and spleen appeared healthy.

The large intestine was much distended; the transverse colon arched downwards, and, with the cæcum and sigmoid flexure, almost filled the whole abdomen. This enlargement was chiefly due to gas, but in the rectum was a quantity of hard scybalous fæces, which protruded from the anus and pushed the perinæum outwards.

The kidneys weighed eleven ounces, and had a fatty appearance on section. Under the microscope the renal epithelium was seen to be quite dark and opaque, from the presence of granules and globules of various sizes obscuring the nucleus.

The stroma appeared to be healthy.

The uterus and ovaries were healthy.

STATISTICAL ANALYSIS
OF THE
PATIENTS TREATED IN GUY'S HOSPITAL
DURING THE YEAR 1873.

By J. C. STEELE, M.D.

THE accompanying tables, which appear in a more abridged form than the corresponding returns of previous years, are intended mainly to indicate the amount of relief afforded by the hospital in the course of the year, arranged, as far as possible, to facilitate comparison with the results of the practice of former years.

The first table or general statement of the numbers treated in the wards contains the main facts connected with the residence of the patients, the issue of their diseases, and their average stay in the hospital, arranged into medical and surgical sub-divisions. On comparing the data from this source with the corresponding returns of previous years, it may be noticed that the total number of patients under treatment in the course of the year was less by 257, than the corresponding number for 1872, although larger considerably than the mean number for many years prior to that date. It may also be noticed, that, notwithstanding the numerical reduction referred to, the hospital has been more fully occupied during the past year, than at any previous epoch; the daily average number resident, registering 558, or about 50 in excess of the mean daily population prior to 1872. This, of course,

indicates a longer average stay on the part of the patients, and consequently a larger amount of individual relief, but whether the benefits accruing therefrom present an adequate equivalent to the alternative of having to refuse admission, in consequence, to a proportionate number of persons eligible for relief, is a question of grave consideration and difficult of solution. In the course of the past year, the stay of the patients over head has averaged forty days, being two days in excess of the corresponding mean for the two years preceding, and three or four days longer than the mean residence prior to 1871. The experience of hospitals generally goes to prove that the residence of the medical cases is considerably higher than that of the surgical patients, and that in consequence of the utterly hopeless character of the diseases which afflict no inconsiderable number of the former class, the rate of mortality in the hospital is proportionally increased by the longer residence. For many years past, the mean stay of the medical patients has averaged usually three or four days in excess of that of the surgical; and during the year under consideration the period of occupation amounted to forty-one days, being only two days less than the surgical occupation for the same time. On a retrospect of the annual data on this subject, the surgical residence is found to fluctuate between thirty-six and thirty-seven days, while, in the past year, it has extended to 39·13 days, a circumstance mainly attributable to the protracted treatment of cases of diseased joints, and of other surgical affections, which were formerly either more summarily dealt with, or excluded altogether from hospital benefit.

The death-rate during the year amounted to 10·44 per cent. of all the cases treated to a termination; the medical cases, as usual, maintaining the high average of 15·66 per cent., and the surgical of 6·74 per cent. of the patients admitted to the wards. These figures represent pretty accurately the ordinary death-rates in the respective divisions of the hospital, and accord with the corresponding returns for many years prior to 1872, which year being quite an exceptional one, on account of its low average mortality, is purposely excluded from the estimate. The comparatively low death-rate in the surgical wards fluctuating, as it usually does, from 5 to 7 per

cent. of the cases, is mainly accounted for by the admission of so many cases of special disease dissociated from any fatal tendency, nearly 100 beds being reserved for ophthalmic and venereal cases, which are also included in the estimate. The chief causes of surgical mortality may be traced in the accident and operation lists. The former of these presents a summary of 885 cases accompanied with 85 deaths, and the latter takes note of 350 surgical operations, exclusive of those performed for ophthalmic disease, attended with seventy-three fatal results. The numbers vary little from the corresponding returns of previous years, and the causes militating against the successful issue of many of these cases have been of a similar character to those so frequently commented on in previous annual summaries.

The classification adopted in the tables relating to the out-patient department presents a view of the nature and amount of relief afforded, and the allotment of the work. From this it would appear that the number of out-patients, properly so called, namely, those who have been furnished with cards entitling them to continue their attendance for a lengthened period, has remained about the same as in former years, a restriction being properly placed on the daily issue of these cards.

The number so privileged averages about 14,000, but it is possible that many of these may have their cards renewed at the expiry of their first attendance, which is limited to a period of eight weeks, and in which event they have been hitherto counted as separate patients. When to these are added the large number of persons who present themselves at the hospital at any hour of the day or night for advice, together with the patients seen and examined by the junior staff and assistant-surgeons' dressers, in connection with the regular out-patient department, the total number registered falls little short of 80,000 persons; but it is manifestly an error to reckon these as out-patients, in the proper sense of the term, as many may be counted several times over, and a large proportion of the cases are of such a trivial character that it is doubtful whether the privileges of the hospital should be extended to them.

It was noticed in the summary for the year 1872 that one

branch of out-patient relief, namely, that referring to the lying-in department, had increased in extent till the numbers reached a higher figure than they had ever done before. The total number of women attended in that year was 2518; but, as the operations of the charity were entirely confined to the obstetric help afforded by the hospital, and considerable difficulty was felt from time to time in obtaining adequate assistance to meet the annually increasing demands of the applicants, it was thought desirable during the past year to restrict the operations of the charity to a smaller area than has hitherto been the case. On this account the number of women confined through the agency of the charity has diminished somewhat during the past year, the total number attended amounting to 2218 or 305 less than the previous year. The mortality during the year has been unusually severe, sixteen deaths having been reported, of which five were attributed to puerperal pyæmia.

1.—General Statement of the Number of In-door Patients received into the Hospital during the year, with Results of Treatment.

Remaining 1st January, 1873	531
Admitted during the year	5040
Total	5571
Discharged well or convalescent	1404
Relieved	2749
Unrelieved	341
Died	524
Remaining 1st January, 1874	553
	—5571

Average number resident daily, throughout the year . 558 { Males, 312
Females, 246

Mean residence of each patient, in days, 39·88.

Rate of mortality over all the cases, 10·44 per cent. { Males, 11·42 per cent.
Females, 9·0 „

MEDICAL WARDS.		SURGICAL WARDS.	
Remaining 1st January, 1873 .	223	Remaining 1st January, 1873 .	308
Admitted during the year .	2095	Admitted during the year .	2945
Total	2318	Total	3253
Discharged well	624	Discharged well	780
Relieved	946	Relieved	1803
Unrelieved	186	Unrelieved	155
Died	326	Died	198
Remaining 1st January, 1874 .	236	Remaining 1st January, 1874 .	317
	—2318		—3253
Average number daily .	232 { M. 112 F. 120	Average number daily .	326 { M. 200 F. 126
Mean residence of each .	40·07 days.	Mean residence of each .	39·13 days.
Rate of mortality, 15·66 per c. {	M. 18·19 F. 13·10	Rate of mortality, 6·74 per cent. {	M. 7·53 F. 5·46

Causes of the various Accidents admitted in 1873, with the Mortality attending thereon.

CAUSES OF THE ACCIDENTS.	Total cases.	Discharged.		Died.		Remaining.	
		M.	F.	M.	F.	M.	F.
Accidents on the river	46	43	...	2	...	1	...
Assaults	53	31	11	6	1	4	...
Attempts at suicide, excluding poison .	13	6	2	4	...	1	...
Bites and kicks from animals . . .	13	10	2	...	...	...	...
Burns from clothes taking fire . . .	16	...	5	5	6	...	2
„ from heated fluids	24	9	7	4	1	2	1
Collisions between opposing forces .	14	8	1	4	...	1	...
„ with street vehicles	97	65	10	10	3	7	2
Cuts from sharp instruments and missiles	37	26	8	1	...	1	1
Falls down stairs	58	20	31	...	1	3	3
„ from a height	179	139	13	8	...	17	2
„ on the ground	164	98	43	4	2	14	3
„ of heavy weights	72	56	2	5	1	7	1
Foreign bodies in internal passages .	13	7	5	1	...	...	...
Gunshot wounds	1	...	1	...	...	...	...
Machinery accidents	36	30	...	2	...	4	...
Poisoning, accidental	5	4	...	...	...	1	...
„ intentional	6	2	2	2	...	...	...
Railway accidents	29	15	1	10	...	2	1
Torsions of the body	8	6	...	1	1	...	...
Total	885	575	144	69	16	65	16

Ankle .	.	.	.	.	.	2	..	..	..	..	..	Meningitis, emphysema ..	..
Elbow	.	.	.	.	.	3	1	..	..	..	..	..	..
<i>Excision of Diseased Bones—</i>													
Head of Femur	.	.	.	.	.	..	1	..	..	..	Pyæmia ..	..	..
Part of "	.	.	.	.	.	9	4	..	..	..	Pyæmia ..	..	..
tibia	.	.	.	.	.	12	2	..	..	1	..	..	..
" fibula	.	.	.	.	.	3	..	..	..	..	..	..	..
Foot and ankle	.	.	.	.	.	4	3	..	..	..	..	..	..
Head of humerus	.	.	.	.	.	3	..	..	..	..	..	..	..
Part of "	.	.	.	.	.	2	1	..	..	..	..	..	..
" radius	.	.	.	.	.	2	..	1	..	..	..	..	..
" jaw	.	.	.	.	.	3	2	..	..	1	Pneumonia ..	..	..
" cranium	.	.	.	.	.	1	..	..	..	1	Lardaceous viscera	..	..
" other bones	.	.	.	.	.	3	..	..	..	..	..	..	Nose, rib, vertebra.
Excision of testicle	.	.	.	.	.	4	..	..	..	..	..	..	Cancerous and fungoid disease.
" penis	.	.	.	.	.	2	..	..	..	..	..	..	Cancer.
" nervus	.	.	.	.	.	1	4	..	..	..	..	..	Parts affected—Hand, side, hip, lip, and ear.
" epulis	.	.	.	.	.	2	2	..	..	..	..	..	Diffuse aneurism, popliteal aneurism.
Ligature of femoral artery	.	.	.	.	.	1	..	..	..	2	Pyæmia, gangrene	..	Popliteal aneurism.
Pressure for aneurism	.	.	.	.	.	2	..	..	..	..	..	..	Double popliteal aneurism.
" "	.	.	.	.	.	1	..	..	..	..	Endocarditis, diseased arteries	..	Stuffing sac with horsehair.
Operation on aneurismal sac	.	.	.	.	.	..	..	..	..	1	..	..	..
Ovariectomy	.	.	.	.	.	..	3	..	..	7	Peritonitis, hemorrhage...	..	Cyst universally adherent.
Incision into ovarian cyst	.	.	.	.	.	..	..	..	..	1	..	..	Impending death from intestinal obstruction.
Abdominal section	.	.	.	.	.	..	..	..	..	1	Intestinal band ..	..	Cancer of rectum, intestinal obstruction.
Colotomy.	.	.	.	.	.	1	..	..	..	3	Peritonitis	..	Abscess of bladder.
Lithotomy	.	.	.	.	.	4	1	..	..	2	Suppuration of kidneys	..	Scald of throat, group, laryngitis.
Vesicotomy	.	.	.	.	.	..	..	..	..	1	..	..	..
Tracheotomy	.	.	.	.	.	3	1	..	..	1	Chloroform, laryngitis	..	..

Surgical Operations, exclusive of Amputations, 1873—continued.

	Cured.		Unrelieved.		Dead.		FATAL COMPLICATIONS.	REMARKS.
	M.	F.	M.	F.	M.	F.		
Perineal section	12	...	...	...	1	...	Inflammation of bladder...	Stricture and extravasation. Gunshot wound of neck.
Extraction of shot . . . . .	...	1	...	...	...	...
<i>Reparatory Operations—</i>								
Harelip	5	1	...	...	...	...	...
Cleft palate	5	3	1	...	...	...	...
Tenotomy	3	1	...	...	...	...	...
Cicatrices from burns	4	1	...	...	...	...	...
" other causes	2	...	...	...	...	...	...
Congenital deformity	1	...	...	...	...	1	Peritonitis.	Web fingers, occluded anus.
<i>Operations for Hernia—</i>								
Radical cure	2	...	...	...	...	...	...
Inguinal hernia, taxis	9	...	...	...	...	...	...
" herniotomy	3	1	...	...	2	1	...	Sac opened in all.
Femoral hernia, taxis	2	2	...	...	...	...	...	Sac opened.
" herniotomy . . . . .	...	6	...	...	4	7	...	Sac not opened.
" . . . . .	...	1	...	...	...	...	...
Total	136	101	3	3	28	23		

Table of Amputations, 1873.

AMPUTATIONS.	Ages of cured.	Ages of deaths.	Cured.		Died.		FATAL COMPLICATIONS.
			M.	F.	M.	F.	
<i>Primary, for Injury—</i>							
Through thigh	42	67, 27	1	...	2	...	Shock, exhaustion.
" knee-joint	59	58	1	...	1	...	Emphysema pulmonum.
Double amputation through knee-joint and thigh . . . . .	...	52	...	...	1	...	Railway injury.
Through leg	28, 48	41, 72	2	...	2	...	Gangrene.
At shoulder-joint	12	...	1	...	...	...	...
Through arm	7, 30, 32	...	2	1	...	...	...
At wrist-joint	22	...	1	...	...	...	...
Amputation of hand	14, 15	...	2	...	...	...	...
Part of hand . . . . .	...	...	5	...	...	...	...
<i>Secondary, for Injury—</i>							
Through fore-arm . . . . .	...	18	...	...	1	...	Pyæmia, gangrene.
Of hand . . . . .	...	80	...	...	1	...	Old age, sloughing from burn.
Of leg	2	30	1	...	1	...	Pyæmia.
<i>Secondary, for Disease—</i>							
Through hip-joint . . . . .	...	14	...	...	1	...	Lardaceous viscera.
" thigh . . . . .	...	...	4	2	3	...	Pyæmia, gangrene, elephantiasis.
" knee-joint	44	...	1	...	...	...	Gangrene.
" leg	8, 8, 22, 35	57	2	2	1	...	...
Of foot (Chopart)	30	...	1	...	...	...	...
Through shoulder-joint	15	...	1	...	...	...	...
" forearm	67	...	1	...	...	...	...
" wrist-joint	16	...	...	1	...	...	...
Part of hand . . . . .	...	...	1	1	...	...	...
Total			27	7	14	...	

Operations on the Eyes, compiled by Mr. P. Owen Jones.

OPERATIONS.	IN-PATIENTS.							OUT-PATIENTS.			Total operations.	
	EYE.			RESULT.				EYE.				
	Right.	Left.	Both.	Cured.	Im- proved.	Not im- proved.	Under treat.	Not stated.	Right.	Left.		Both.
<i>Eyelids—</i>												
Ectropion . . . . .	...	...	...	...	...	...	...	...	1	1	...	2
Entropion	1	...	...	...	...	...	1	...	1	2	...	4
Enlargement of palpebral aperture	1	1	1	1	1	...	...	1	...	...	...	4
Closure " "	2	...	3	1	1	1	...	3	...	2	...	10
Nevus, operation for . . . . .	...	1	...	1	...	...	...	...	...	...	...	1
<i>Lacrimal apparatus—</i>												
Opening lacrimal sac	2	...	...	1	...	...	...	1	1	...	...	3
Destruction of lacrimal sac	7	3	...	2	3	...	2	3	...	...	...	10
<i>External muscles of eyeball—</i>												
Operation for convergent strabismus	1	...	...	1	...	...	...	...	8	12	40	101
" "												

	25	22	18	35	40	8	61	68	40	292
Iridectomy for artificial pupil	.	.	3	1	3	9	..	3	2	18
" glaucoma	.	.	2	..	3	1	..	..	..	4
Removal of entire iris	.	.	..	..	..	..	..	..	..	..
<i>Eye-ball—</i>										
Operation for staphyloma	.	..	..	..	1	..	..	2	..	3
Abscission	.	2	1	3	..	..	2	2	..	7
Excision	.	8	..	13	3	1	3	5	..	24
<i>Crystalline lens—</i>										
Removal of, for glaucoma	..	1	..	1	..	..	..	..	..	1
Iridectomy extraction	. 22	25	13	45	17	..	..	..	..	73
Common extraction	. 16	13	11	35	7	3	..	..	..	51
Oblique corneal section	. 1	2	1	2	1	..	..	..	..	5
Suction	. ..	2	..	1	..	..	..	..	..	2
Needle operation	. 4	2	1	1	1	2	..	..	..	8
Removal of opaque capsule	. 7	5	5	10	9	2	..	..	..	22
Total	118	102	132	163	128	18	86	111	166	715
	352						319			

The results of operations on out-patients do not appear, as they are to a great extent unobtainable. The numerous minor operations for tarsal tumours, epiphora, &c., are not recorded.

The operations upon both eyes are counted as two operations.

There were two deaths from anæsthetic agents, one from chloroform, and one from methylene ether.

OUT-PATIENT DEPARTMENT, 1873.

The following numbers include such patients as were furnished with cards and prescription papers, to enable them to continue their attendance for a period of eight weeks :—

	Males.		Females.		Total.
Ordinary medical cases .	1,464	.....	1,662	.....	3,126
Ordinary surgical cases .	1,797	.....	1,884	.....	3,681
Diseases peculiar to women	...	.....	1,719	.....	1,719
Diseases of the eyes .	1,518	.....	1,838	.....	3,356
Diseases of the skin .	471	.....	523	.....	994
Diseases of the ear .	583	.....	749	.....	1,332
Total .	5,833	.....	8,375	.....	14,208

Besides the above registered cases there were prescribed for in the out-patients' rooms by the house physicians, and senior students under the supervision of the surgeons—

	Males.		Females.		Total.
Medical patients .	3,287	.....	5,245	.....	8,532
Surgical patients .	21,523	.....	20,147	.....	41,670

The number of minor accidents and other urgent cases attended to in the surgery by the house surgeons and dressers were 10,770—of which 7,648 were men and 3,122 were women and children.

The dental cases attended to in the surgery were 2,204—of which 956 were males and 1,248 were females.

The number of women confined and attended by the obstetric residents and students was 2,213.

DETAILS OF MIDWIFERY DEPARTMENT.

Number of women confined during the year .	2,213
Number of single births, 2,190; twin births, 23. Total children .	2,236
Living male children .	1,142
Living female „ .	1,006
Dead male „ .	54
Dead female „ .	34
	2,236

Of the above children 2,145 presented naturally at birth, 43 were cases of breech presentation, 14 were face, 13 foot, 11 hand, 2 transverse, and 8 were complicated with placenta previa.

Surgical operations found necessary to complete labour were 34 in number, namely—4 craniotomy, 13 cases of version, and 17 cases in which the long forceps were employed.

Among the mothers there were 16 deaths from the following causes, namely :—Puerperal pyæmia, 5; peritonitis, 4; pneumonia, 2; post-partum hæmorrhage, 2; convulsions, 1; exhaustion, 1; phthisis, 1.

Among the mothers there were in their

1st confinement . . .	338	Brought forward . . .	2114
2nd " . . .	325	11th confinement . . .	41
3rd " . . .	326	12th " . . .	30
4th " . . .	281	13th " . . .	15
5th " . . .	246	14th " . . .	6
6th " . . .	192	15th " . . .	1
7th " . . .	172	16th " . . .	1
8th " . . .	107	17th " . . .	2
9th " . . .	80	18th " . . .	3
10th " . . .	47		
	<hr/> 2114	Total . . .	<hr/> 2213

Retrospective Summary of the Patients relieved during the year 1873.

	Males.	Females.	Total.
Patients under treatment in the wards . . .	3,157	2,414	5,571
Out-patients—			
Medical, ordinary	1,464	1,662	3,126
Surgical, ordinary	1,797	1,884	3,681
Diseases of women . . . . .	...	1,719	1,719
Diseases of the eyes	1,518	1,838	3,356
Diseases of the skin	471	523	994
Diseases of the ear	583	749	1,332
Medical casual or slight cases	3,287	5,245	8,532
Surgical casual or slight cases	21,523	20,147	41,670
Minor accident and surgery cases	7,648	3,122	10,770
Tooth extractions	956	1,248	2,204
Midwifery patients . . . . .	...	2,213	2,213
 Total	 42,404	 42,764	 85,168

Retrospective Summary of all the Patients Treated in Guy's Hospital since 1864.

	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1873.
IN-PATIENTS.									
Under treatment during the year . . .	5,511	5,715	5,510	5,245	5,297	5,164	5,123	5,549	5,571
Discharged well or convalescent . . .	2,538	2,622	2,389	2,109	2,237	1,682	1,673	1,832	1,400
Relieved	1,504	1,633	1,515	1,532	1,551	2,047	2,057	2,203	2,749
Unrelieved	419	400	390	483	411	470	396	422	341
Discharged for special reasons . . .									
Died	61	71	189	146	116	...	...	...	...
Rate of mortality per cent.	480	488	534	509	466	496	498	555	471
Average number daily resident . . .	958	935	1064	1065	972	1056	1076	1107	1044
Mean residence of each in days . . .	497	501	496	502	498	487	486	529	556
Number of deaths from accident . . .	32-92	31-99	32-85	34-93	34-31	34-42	36-92	37-58	37-73
Number of accident cases admitted . .	875	1,051	907	911	805	788	821	892	938
Number of deaths from accident . . .	109	102	97	101	83	76	91	85	85
Number of ordinary operations registered	301	337	342	362	417	314	345	316	309
Number of deaths after operations . .	66	65	60	69	70	51	63	76	60
Number of ophthalmic operations . . .	492	656	606	638	624	499	441	678	722
OUT-PATIENTS.									
Surgical cases	3,851	3,749	3,807	4,125	3,905	3,655	3,350	3,983	3,681
Medical cases	3,731	2,987	3,129	3,438	3,456	3,380	3,330	3,216	3,126
Diseases of the eyes	2,477	2,312	2,461	2,914	3,614	3,775	3,580	3,657	3,356
Diseases peculiar to women	1,762	1,635	1,703	1,736	1,675	1,708	1,827	1,740	1,719
Diseases of the skin	493	847	684	801	1,048	1,047	1,055	1,089	994
Diseases of the ear	767	826	731	757	960	913	929	1,262	1,332
Casual or minor medical cases . . .	10,347	9,747	10,045	10,414	10,679	11,152	11,086	10,416	10,308
Casual or minor surgical cases . . .	38,375	33,446	32,827	37,986	41,159	38,820	38,134	37,797	39,135
Tooth extractions	5,299	4,789	5,141	4,748	3,655	1,976	2,589	1,955	2,204
Minor accidents	6,109	6,500	6,030	6,444	6,390	7,319	8,585	5,804	10,770
Women confined at their own homes	1,608	1,568	1,585	1,727	1,783	1,929	2,183	2,240	2,213

LIST
OF
GENTLEMEN EDUCATED AT GUY'S HOSPITAL,
WHO HAVE PASSED THE
EXAMINATIONS OF THE SEVERAL UNIVERSITIES, COLLEGES,
&c., &c.,
IN THE YEAR 1873.

University of Oxford.

Final Examination for the degree of Bachelor of Medicine.

W. H. A. Jacobson, B.A.

University of Cambridge.

Doctor of Medicine.

A. L. Galabin, M.A.

Final Examination for the degree of Bachelor of Medicine.

R. H. Hughes, B.A. | D. B. Lees, B.A.

Second Examination for the degree of Bachelor of Medicine.

T. L. Porter, B.A. | R. M. Simon, B.A.

First Examination for the degree of Bachelor of Medicine.

E. Amphlett, B.A. | R. A. Birdwood, B.A.

University of London.

Examination for the degree of Doctor of Medicine.

Benjamin Neale Dalton.

Logic and Moral Philosophy only.

J. T. Ingoldby.

542 *Gentlemen admitted to Degrees, &c., in the year 1873.*

Examination for the degree of Bachelor of Surgery.

First Division.

R. Clement Lucas, M.B.

With Honours.

Final Examination for the degree of Bachelor of Medicine.

First Division.

C. H. Golding-Bird, B.A.

*Obtained Gold Medal in Forensic Medicine and Honours
in Obstetric Medicine.*

A. Dodson.

*Obtained First Class Honours in Medicine, and the number of marks
qualifying for Gold Medal in Obstetric Medicine.*

First Examination for the degree of Bachelor of Medicine.

First Division.

A. H. Jones.

*Obtained the Scholarship and Gold Medal in Chemistry and Materia
Medica, and Honours in Physiology.*

C. L. Jones.

Obtained Honours in Physiology.

Second Division.

T. R. H. Clunn. | W. H. Lamb.

Excluding Physiology.

First Division.

J. C. Ferrier.

Second Division.

H. Duke.

Physiology only.

G. H. Keyworth. | J. A. Rigby.

Preliminary Scientific M.B. Examination.

First Division.

C. J. Symonds. | C. J. Davey.

L. H. Stevenson.

Obtained Honours in Zoology and Botany.

Second Division.

H. L. Champneys. | R. R. W. Oram.

E. H. Paddison.

University of Aberdeen.

Examination for the Degree of Doctor of Medicine.

J. F. Goodhart, M.B., C.M.

Indian Medical Service.

A. A. Thomas, placed 8th at the February Examination.
 A. J. Willcocks, placed 1st at the August "
 H. K. McKay, placed 7th at the August "

Royal College of Physicians, London.

Examination for the Membership.

J. P. Hartree, M.A., M.B.

Examination for the Licentiate'ship.

C. H. Golding-Bird,	H. Williams.
B.A., M.B.	J. L. Morley.
J. Clague.	A. Gillingham.
R. C. Chicken.	C. E. Barnard.
H. J. F. Groves.	T. D. Ransford.

Royal College of Physicians, Edinburgh.

A. Carter.	E. M. Boddy.
M. Reid.	A. Churchward.
E. S. Medcalf.	

Royal College of Surgeons of England.

Final Examination for the Fellowship.

E. Bovill.	H. Morris, M.A., M.B.
W. H. Jalland.	J. G. Wiseman.
A. A. Thomas.	

First Examination for the Fellowship.

W. H. Harsant.	H. Clarke.
J. C. Ferrier.	W. J. Tyson.
T. S. Morley.	J. Rendall.

Final Examination for the Membership.

January.

J. Clague.	W. Wallis.	H. J. F. Groves.
G. E. Power.	C. B. Elliott.	E. H. Saunders.
C. E. Barnard.	T. D. Ransford.	N. B. Elliot.
H. P. Kingcombe.	H. H. Clyma.	W. H. Spurgin.
	E. C. Rogers.	

544 *Gentlemen admitted to Practice, &c., in the year 1873.*

April.

H. Ashby.	E. A. Bevers.	W. W. Dickinson.
W. A. Garrard.	H. Hetley.	T. D. Paradise.
C. J. W. Pinching.	M. S. Duke.	T. Evans.
R. W. Murphy.	E. Field.	R. H. Foster.
M. Lubbock.	H. A. Cookson.	A. S. Dodson.
P. O. Jones.	A. E. Kessen.	H. P. Tayler.
F. J. S. Smith.	F. T. Atkins.	W. H. Bennett.
J. P. Bevan.	C. D. Fenn.	

August.

E. J. W. Hicks.	R. D. Hughes.	W. O. Jennings.
G. E. Keer.	P. Kingsford.	R. Manser.
W. K. McKay.	J. H. Paley.	F. J. M. Palmer.
R. T. Parkinson.	F. T. Paul.	W. Stericker.

November.

E. O. Day.	G. H. Keyworth.
J. W. H. Hawton.	J. A. Rigby.
J. O. O'Brien.	T. Clunn.
G. J. Chadwick.	M. Lloyd.
C. E. W. Whittington.	H. Evans.

First Examination for the Membership.

January.

H. A. Lovett.	W. C. Morris.
J. F. Breach.	H. Duke.
E. E. Glyde.	B. Jones.
J. B. Richardson.	

April.

R. W. F. Carter.	H. F. Lancaster.	R. Brummitt.
J. Rees.	E. J. Adkins.	H. Caddy.
O. Gwatkin.	A. C. Barrs.	W. H. Lamb.
E. Duke.	G. H. Blackmore.	H. C. Burton.
C. M. Johnston.	W. Cock.	W. A. Hay.
A. L. Bowen.	C. H. Hayes.	D. Elcum.
E. Pritchard.	J. T. W. S. Kellard.	H. Bartlett.
C. Rees.	W. E. Snook.	A. de W. Baker.
F. W. R. Romano.	W. T. Pascoe.	J. Utting.
E. O. Giblin.	W. C. James.	W. C. Theed.
A. Piggot.	H. Cotton.	W. H. Williams.
W. Mount.	A. Dennis.	A. Finch.
J. W. Bull.	G. Davis.	C. G. Lee.
H. C. Taylor.	A. Rawlings.	W. H. L. Welchman.
R. C. Richards.	T. Brown.	St. C. B. Shadwell.
R. E. Carrington.	E. Amphlett.	

[*Gentlemen admitted to Practice, &c., in the year 1873.* 545

May.

E. J. Pilling.	H. C. Strover.	B. Jumeaux.
P. J. Jackson.	W. W. Pinching.	R. L. Lawson.
C. T. Alexander.	J. H. Vinter.	T. H. Palmer.
	J. T. Knight.	

July.

J. W. Ayres.	W. H. Coates.
F. C. Coley.	A. D. Branchley.
J. F. J. Sykes.	A. C. Routh.
A. G. Lacey.	T. C. Barlow.

Apothecaries' Society.

Final Examination for the Licentiate ship.

January.

H. J. F. Groves.	G. E. Keer.
W. E. Hacon.	M. S. Duke.
W. A. May.	

February.

J. A. Burton.	E. C. Rogers.	R. H. Foster.
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March.

H. B. Collins.	O. D. Fenn.
W. H. Spurgin.	H. A. Cookson.
W. C. Hansell.	R. Manser.
F. J. M. Palmer.	

April.

R. S. Armstrong.	H. Evans.	O. E. Barnard.
E. M. Boddy.	W. W. Dickinson.	O. J. W. Pinching.
J. Clare.	D. Nunez.	W. Stericker.

May.

W. G. Nash.

June.

S. Bingham.	E. S. Medcalf.	F. W. Saberton.
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July.

H. K. McKay.	A. Hooper.
J. W. H. Hawton.	A. Carter.

August.

E. O. Day.	T. H. B. Rodwell.
G. H. Keyworth.	J. W. Davies.
J. W. Foreman.	

September.

A. Churchward.		J. Rendall.
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October.

H. F. Eastall.		T. R. H. Clunn.
J. A. Rigby.		T. D. Ransford.

November.

J. O. O'Brien.		W. T. Gard.		O. R. Travers.
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First Examination for the Licentiate'ship.

December, 1872.

E. C. Rogers.		Alfred Hooper.
Albert Carter.		J. H. Paley.

January.

A. B. Crowther.		H. M. Powell.		F. W. Saberton.
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February.

T. R. H. Clunn.		H. F. Eastall.		E. O. Reynolds.
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March.

W. Stericker.		L. J. Wilding.		C. L. Webb.
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April.

J. T. Carey.		A. Bevan.
J. J. Newman.		E. F. Thomas.

May.

C. J. C. Mitchell.		J. L. Treharne.		C. T. Alexander.
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July.

H. J. Hind.		H. B. Dry.		E. S. Newton.
F. W. R. Romano.		E. Duke.		H. Bartlett.
T. W. S. Kellard.		R. Brummitt.		O. Gwatkin.

August.

H. Caddy.		D. Elcum.		W. A. Simmonds.
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November.

C. M. Johnson.		W. M. Jones.
W. O. James.		W. E. Snook.
J. B. Richardson.		T. C. Barlow.
W. A. E. Hay.		

December.

D. T. Evans.		C. Rees.
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GUY'S HOSPITAL MEDALLISTS AND PRIZEMEN, 1872-73.

EXAMINATION OF STUDENTS IN MEDICINE AND ITS
ALLIED SCIENCES, JULY, 1873.

The Treasurer's Gold Medal for Medicine.

Henry Ashby, Croydon.

Frank Thomas Paul, Pentney, Norfolk, "*Proxime Accessit*."

The Treasurer's Gold Medal for Surgery.

Frank Thomas Paul, Pentney, Norfolk.

Third Year's Students.

Daniel Herbert Forty, Shillingford, First Prize, £40.

Henry Clarke, Anerley, Second Prize, £35.

David B. Lees, B.A., Manchester, Certificate.

Samuel Bingham, Kirton in Lindsey, Lincolnshire, Certificate.

Second Year's Students.

Henry Francis Lancaster, Southsea, Hants, First Prize, £35.

William Ernest Snook, Olyton, Devonshire, Second Prize, £30.

John Utting, Dereham, Norfolk, Certificate.

Williams Cock, Redruth, Cornwall, Certificate.

First Year's Students.

Joseph Waterhouse, Ryde, Isle of Wight, First Prize, £30.

William Percy Reynolds, Dulwich, Second Prize, £25.

Richard Bevan, Redruth, Cornwall, Third Prize, £10 10s.

(*Presented by one of the Governors.*)

Thomas W. Richards, Cardiff, Certificate.

John Brett, London, Certificate.

Alfred Charles Parker, Worthington, Leicestershire, Certificate.

John Davies, Carmarthen, Certificate.

Alfred Moxon Turner, Hempsted, Gloucester, Certificate.

ENTRANCE EXAMINATION IN CLASSICS, MATHEMATICS, ETC.

Alfred Moxon Turner, Hempsted, Gloucester, First Prize, £25.

No Second Prize awarded.

Thomas Arthur Richardson, Third Prize, £15.

Robert Spencer Wainwright, Lee, Kent, Certificate.

Thomas Jones, High School, Bishop's Stortford, Certificate.

Pupils' Physical Society.*Session 1873-74.***Honorary President.—Mr. COCK.****Vice-Presidents.**

Messrs. H. Ashby; C. E. Barnard; J. P. Bevan; C. H. Golding-Bird, B.A., M.B.; H. S. Branfoot; R. C. Chicken; T. Eastes; W. H. Harsant; H. Hetley; E. Hicks; F. J. M. Palmer; F. T. Paul; R. J. Pye-Smith; T. D. Ransford; and F. C. Turner, M.A., M.B.

PRIZE-MEN FOR SESSION 1872-73.

Mr. H. Ashby, £10, for his Paper on "Some Points in Clinical Chemistry," read before the Society.

Mr. Harsant, £5, for his Paper on "The Action and Mode of Administration of Mercury in Syphilis."

Mr. Hicks, £5, for his Paper on "The Variations of Zymotic Diseases."

Mr. F. J. M. Palmer, £5, as the Member who had most distinguished himself in the Debates of the Session.

CLINICAL APPOINTMENTS HELD IN THE YEAR 1873.**RESIDENT HOUSE PHYSICIANS.**

N. Kiddle.	C. S. Ticehurst.
F. J. Carey, M.A.	A. L. Galabin, M.A., M.D.
F. C. Turner, M.A., M.B.	R. J. Pye-Smith.

RESIDENT HOUSE SURGEONS.

F. C. Turner, M.A., M.B.	C. H. Golding-Bird, B.A., M.B.
R. J. Pye-Smith.	T. Eastes.
G. F. Kirby Smith.	J. L. Morley.

RESIDENT OBSTETRIC ASSISTANTS.

T. Eastes.	W. Williams.	W. H. A. Jacobson,
A. L. Galabin, M.A.,	J. L. Morley.	B.A., M.B.
M.D.	H. S. Branfoot.	M. S. Duke.
C. H. Golding-Bird,	G. F. Kirby Smith.	R. H. Hughes, B.A., M.B.
B.A., M.B.	G. E. Power.	T. D. Ransford.

SURGEON'S DRESSERS.

R. Manser.	J. P. Bevan.	A. M. French.
H. Williams.	T. D. Paradise.	S. Bingham.
H. Hetley.	J. S. Wilkins.	W. J. Tyson.
E. J. W. Hicks.	H. K. McKay.	C. Duran.
F. T. Paul.	M. Lubbock.	J. Rendall.
R. C. Chicken.	A. N. Taylor.	D. H. Forty.
G. H. Keyworth.	W. E. Paley.	W. A. Simmonds.
W. C. Hansell.	E. Field.	

CLINICAL ASSISTANTS.

T. D. Ransford.	J. P. Bevan.	H. Hetley.
M. S. Duke.	J. A. Rigby.	H. Williams.
G. E. Power.	C. E. Barnard.	R. Manser.
W. H. A. Jacobson, B.A.,	H. Ashby.	F. T. Paul.
M.B.	D. B. Lees, B.A.	J. F. Fry.
V. D. W. Jones.	R. C. Chicken.	A. M. French.
W. E. Hacon.	D. Nunez.	E. O. Day.

DRESSERS IN THE EYE WARDS.

T. D. Paradise.	T. Eastes.	J. Foreman.
J. L. Morley.	T. D. Ransford.	J. P. Bevan.
S. Smith.	N. B. Elliot.	E. O. Day.
D. B. Lees, B.A.	T. R. H. Clunn.	E. S. Medcalf.
	F. T. Paul.	

POST-MORTEM CLERKS.

J. Clare.	E. O. Reynolds.	W. D. L. Hay.
D. Nunez.	C. E. Barnard.	H. Cotton.
A. B. Crowther.	P. Boyd.	F. G. Elliot.
J. Morris.	C. E. Winckworth.	J. F. J. Sykes.
H. A. Lovett.	C. Rees.	G. H. Blackmore.

ASSISTANT-SURGEON'S DRESSERS.

C. D. Fenn.	H. J. Hind.	H. Evans.
R. C. Gibb.	J. M. Hobson.	W. C. Morris.
H. K. McKay.	L. J. Wilding.	W. R. Johnson.
S. W. Spark.	J. H. Paley.	E. A. H. Herbert.
F. F. Bradshaw.	M. Lloyd.	J. W. Bond.
C. Duran.	H. A. Cookson.	J. O. Ferrier.
C. E. Barnard.	A. B. Crowther.	D. Nunez.
J. F. Fry.	E. F. Thomas.	T. Richards.
A. Sangster, B.A.	V. D. W. Jones.	J. Rees.
D. H. Forty.	A. Churchward.	E. Whitworth.
E. S. Robson.	S. Bingham.	O. R. Travers.
B. N. Collins.	T. S. Morley.	C. E. Winckworth.
R. W. Murphy.	F. W. Saberton.	W. Cock.
J. Rendall.	W. W. Pinching.	W. C. James.
O. Edwards.	W. Brown.	E. O. Giblin.
J. W. Mason.	E. R. L. Crespín.	H. C. Burton.
W. E. Paley.	D. F. Walker.	A. J. Ockenden.
W. Y. Davenport.	H. M. Powell.	A. Carey.
F. J. M. Palmer.	A. Mandri.	J. H. Vinter.
E. O. Reynolds.	E. O. Day.	R. Brummitt.
R. J. Morton.	J. J. Newman.	J. Utting.

DRESSERS IN THE SURGERY.

J. H. Paley.	C. J. C. Mitchell.	J. C. Ferrier.
M. Reid.	W. Guy.	M. Lloyd.
A. Carter.	E. S. Medcalf.	J. W. Davies.
F. W. Saberton.	W. R. Johnson.	A. Hooper.
J. B. Booth.	J. J. Newman.	D. F. Walker.
C. J. Davey.	J. M. Hobson.	J. T. Carey.

DRESSERS IN THE SURGERY (continued).

J. B. Richardson.	H. Caddy.	E. B. Kavanaugh.
J. F. Dell.	W. H. Hall.	W. M. Jones.
W. C. Morris.	H. C. Burton.	E. E. Glyde.
H. Duke.	D. Elcum.	A. de W. Baker.
B. Jones.	A. L. Bowen.	E. S. Newton.
J. L. Treharne.	W. S. Pascoe.	F. Marr.
D. Lewis.	T. A. McCullagh.	E. Amphlett, B.A.
H. A. Lovett.	J. Rees.	Ang. Dennis.
C. J. Davey.	W. Cock.	A. Piggot.
E. Whitworth.	O. Gwatkin.	H. F. Lancaster.
E. O. Giblin.	J. F. Breach.	H. F. Bartlett.
P. O. Jones.	R. C. Richards.	C. M. Johnson.
A. J. Ockenden.	E. Duke.	J. T. W. Kellard.
W. E. Dring.	R. Brummitt.	C. Rees.
J. W. Bond.	C. Taylor.	W. Brown.
E. A. H. Herbert.	W. H. Lamb.	W. Mount.
A. Carey.	A. H. Jones.	St. C. Shadwell.
C. T. Alexander.	W. H. Coates.	

DENTAL SURGEON'S DRESSERS.

W. J. Gard.	J. Rendall.	O. R. Travers.
F. J. Elliot.	H. Clarke.	E. O. Reynolds.
J. W. Mason.	R. Manser.	W. H. Hall.
W. H. Harsant.	D. Nunez.	

AURAL SURGEON'S DRESSERS.

E. M. Boddy.	J. A. Burton.
D. Nunez.	A. Hooper.
F. W. Saberton.	

CLINICAL WARD CLERKS.

W. E. Paley.	J. W. H. Hawton.	L. Rudd.
F. J. M. Palmer.	C. Duran.	H. F. Eastall.
G. H. Keyworth.	A. Hooper.	M. Lloyd.
L. Davies.	D. H. Forty.	C. J. C. Mitchell.
A. M. French.	S. Bingham.	J. W. Davies.
R. D. Hughes.	H. Evans.	A. Sangster, B.A.
W. Y. Davenport.	H. N. Smith.	R. C. Gibb.
C. L. Webb.	E. O. Day.	J. W. Trevor.
A. N. Taylor.	E. S. Medcalf.	T. S. Morley.
H. A. Cookson.	F. W. Saberton.	W. H. Harsant.
K. H. Foster.	O. Edwards.	G. W. Bond.
P. O. Jones.	J. T. Carey.	W. C. Morris.
R. F. Tomlin.	J. H. Paley.	R. J. Morton.
E. O. Reynolds.	J. Griffiths.	J. B. Richardson.
A. Churchward.	W. C. James.	H. A. Lovett.
E. S. Robson.	A. Carter.	T. C. Barlow.
F. F. Bradshaw.	L. J. Wilding.	Henry Clarke.
M. Reid.	J. Rendall.	A. B. Crowther.
H. A. Collins.	J. F. Fry.	D. T. Evans.
E. Field.	E. O. Reynolds.	H. J. Hind.
E. M. Boddy.	W. J. Tyson.	

ASSISTANT-PHYSICIANS' CLERKS.

L. Rudd.	J. J. Newman.	A. B. Crowther.
H. Clarke.	O. R. Travers.	Henry Evans.
J. S. Wilkins.	R. F. Tomlin.	A. Bevan.
G. E. Keer.	J. F. Fry.	J. W. Mason.
W. H. Harsant.	J. Griffiths.	E. O. Reynolds.
T. S. Morley.	M. Reid.	A. Hooper.
L. J. Wilding.	D. H. Forty.	H. Duke.
H. Evans.	H. N. Smith.	F. W. R. Romano.
A. Sangster.	E. Whitworth.	G. H. W. Thomas.
W. J. Tyson.	W. E. Snook.	J. M. Hobson.

SURGICAL WARD CLERKS.

C. Seymour.	G. Davis.	E. J. Adkins.
E. Bowen.	J. Mackern.	C. M. Johnson.
J. L. Treharne.	R. P. Crookshank.	W. A. Hay.
E. S. Newton.	A. Bevan.	E. Prichard.
G. H. W. Thomas.	H. H. Williams.	A. Smart.
T. A. McCallagh.	F. J. Wells.	R. Chadwick.
W. T. Pascoe.	E. F. Ingram.	C. W. Lacey.
J. Boughton.	W. M. Evans.	J. C. Wilkinson.
O. Seth.	T. Richards.	G. A. Hunt.
W. Maltby.	E. J. Donbavond.	S. Smith.
J. R. Judson.	P. E. Wallis.	H. C. Strover.
J. Waterhouse.	C. F. Lee.	G. H. Blackmore.
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W. C. James.	A. J. Lacey.	Alfred Finch.
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W. Brown.	T. Brown.	F. Marr.
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J. Todd.	J. Davies.	R. M. Simon, B.A.
F. W. Trevor.	G. T. Gardner.	F. C. Coley.
A. Mandri.	A. G. Lacey.	P. J. Jackson.
W. A. Kidd.	A. Piggot.	

GUY'S HOSPITAL.

THE SESSION OF 1873-74 COMMENCED ON THE 1st OCTOBER,
1873.

The INTRODUCTORY ADDRESS was given by
JAMES HINTON, Esq.,

In the Anatomical Theatre, on Wednesday, the First of October, 1873, at Two
o'clock, after which the Medals and Prizes for the past Session
were distributed by the Treasurer.

MEDICAL AND SURGICAL STAFF.

Consulting Physicians.

SIR WILLIAM GULL, Bart., M.D., D.C.L., F.R.S.; G. OWEN REES, M.D., F.R.S.

Physicians.

S. O. HABERSHON, M.D.; S. WILKS, M.D., F.R.S.; F. W. PAVY, M.D., F.R.S.;
W. MOXON, M.D.

Assistant Physicians.

C. HILTON FAGGE, M.D.; P. H. PYE-SMITH, M.D.; FREDERICK TAYLOR, M.D.

Consulting Surgeons.

J. HILTON, Esq., F.R.S.; E. COCK, Esq.

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J. BIRKETT, Esq.; J. COOPER FORSTER, Esq.; THOMAS BRYANT, Esq.;
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Assistant Surgeons.

H. G. HOWSE, M.S.; N. DAVIES-COLLEY, M.C.

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Obstetric Physician.—J. BRAXTON HICKS, M.D., F.R.S.

Assistant Obstetric Physician.—A. L. GALABIN, M.A., M.D.

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Assistant Ophthalmic Surgeon.—C. HIGGINS, Esq.

Dental Surgeon.—S. J. A. SALTER, M.B., F.R.S.

Assistant Dental Surgeon.—H. MOON, Esq.

Aural Surgeon.—JAMES HINTON, Esq.

Medical Registrar.—FREDERICK TAYLOR, M.D.

Surgical Registrar.—J. F. GOODHART, M.D.

Apothecary.—JAMES STOCKER, Esq.

WINTER COURSES.

LECTURES.

Medicine.—Dr. WILKS and Dr. HABERSHON.

Mondays, Wednesdays, and Fridays, at Three.

Clinical Medicine.—Dr. HABERSHON, Dr. WILKS, Dr. PAVY, and Dr. MOXON.

Saturdays, at Half-past One.

Surgery, including Demonstrations in Practical Surgery.

Mr. BIRKETT and Mr. COOPER FORSTER, assisted by Mr. RENDLE.

Tuesdays and Thursdays, at Half-past Three, Fridays, at Half-past Ten.

Clinical Surgery.—Mr. BIRKETT, Mr. FORSTER, Mr. BRYANT, and Mr. DURHAM.

Wednesdays, at Half-past One.

Anatomy, Descriptive and Surgical.—Mr. DURHAM and Mr. HOWSE.

Tuesdays, Wednesdays, Thursdays, and Fridays, at Nine.

Physiology and General Anatomy.—Dr. PAVY and Dr. PYE-SMITH.

Mondays, Wednesdays, and Fridays, at a Quarter-past Four.

Clinical Lectures on Midwifery and Diseases of Women.—Dr. BRAXTON HICKS.

Wednesdays, at Half-past One.

Chemistry.—Dr. DEBUS and Dr. STEVENSON.

Tuesdays, Thursdays, and Saturdays, at Eleven.

Experimental Philosophy.—Mr. REINOLD.

Saturdays, at One.

DEMONSTRATIONS.

Anatomy.—Mr. DAVIES-COLLEY, *Demonstrator,*

Mr. RENDLE and Mr. CLEMENT LUCAS, *Assistant Demonstrators, Daily.*

Morbid Anatomy.—Dr. FAGGE and Dr. GOODHART, *Daily, at Half-past Two.*

Practical Physiology.—Dr. PYE-SMITH.

Mondays, Thursdays, and Saturdays, at half-past One.

SUMMER COURSES.

LECTURES.

Materia Medica and Therapeutics.—Dr. MOXON.
Tuesdays, Thursdays, and Fridays, at Three.

Midwifery and Diseases of Women.—Dr. BRAXTON HICKS.
Tuesdays, Wednesdays, Thursdays, and Fridays, at a Quarter to Nine.

Medical Jurisprudence.—Dr. ALFRED TAYLOR.
Tuesdays, Thursdays, and Saturdays, at Ten.

Clinical Medicine.—Dr. FAGGE, Dr. PYE-SMITH, and Dr. FREDERICK TAYLOR.
Wednesdays, at Half-past One.

Clinical Surgery.—Mr. HOWSE and Mr. DAVIES-COLLEY.
Fridays, at Half-past One.

Ophthalmic Surgery.—Mr. BADER.
Fridays, at Three.

Clinical Lectures on Diseases of Women.—Dr. A. L. GALABIN.
Mondays, at Three.

Pathology.—Dr. FAGGE, *Saturdays, at Nine.*

Hygiene.—Dr. FAGGE.
Mondays and Fridays, at a Quarter past Twelve.

Comparative Anatomy and Zoology.—Dr. PYE-SMITH.
Mondays and Fridays, at half-past One.

Mental Diseases.—Dr. SAVAGE, *Mondays, at Ten.*

Botany.—Dr. STOKOE.
Tuesdays, Thursdays, and Saturdays, at Half-past Eleven.

DEMONSTRATIONS.

Practical Chemistry.—Dr. DEBUS.
Mondays, Wednesdays, and Fridays, Ten to One.

Operative Surgery.—Mr. DURHAM.
Mondays and Thursdays, at Half-past Three.

Practical Courses and Classes in Botany, Comparative Anatomy, Morbid Histology and Natural Philosophy.

The Registrars, and the Demonstrators of Anatomy and Chemistry, assist Pupils in their Studies, and prepare them for their several Examinations by Special Class Instruction, during both Winter and Summer Sessions.

The Hospital now contains 715 beds. Of these 221 are for Medical Cases; 250 for Surgical; 26 for Gynæcological; 48 for Syphilitic, and 50 for Ophthalmic cases. There are also 30 Children's cots and 84 reserve beds (8 in private rooms).

In connection with the Lying-in-Charity, about 2500 cases are annually attended by the Students.

Number of Patients relieved during the last year, about 81,000.

Clinical Lectures—Medicine, Surgery, and Midwifery—Weekly.

Museum of Anatomy, Pathology, and Comparative Anatomy—Curator, **HILTON FAGGE**, M.D.—contains 10,000 specimens, 4000 drawings and diagrams, an unique collection of Anatomical Models, and a series of 400 Models of Skin Diseases.

Gentlemen desirous of becoming Students must give satisfactory testimony as to their education and conduct. Fees:—£40 for the first year; £40 for the second; £20 for the third; and £10 for succeeding years of attendance. 100 Guineas in one payment entitles a Student to a perpetual ticket.

The House-Surgeons and House-Physicians, the Clinical Assistants, Dressers, Clinical Clerks, Obstetric Residents, and Dressers in the Eye Wards, are selected from the Students according to merit.

The House-Surgeons, House-Physicians, and Obstetric Clerks (and the Dressers during their weeks of duty), have rooms and commons in the Hospital.

Six Scholarships, varying in value from £25 to £40 each, are awarded at the close of each Summer Session for general proficiency.

Two Gold Medals are given by the Treasurer—one in Medicine, and one in Surgery.

A Voluntary Examination takes place at Entrance, in Elementary Classics and Mathematics. The first three candidates receive respectively £25, £20, and £15.

Several of the Lecturers have vacancies for Resident Private Pupils.

For further information apply to Mr. Stocker.





